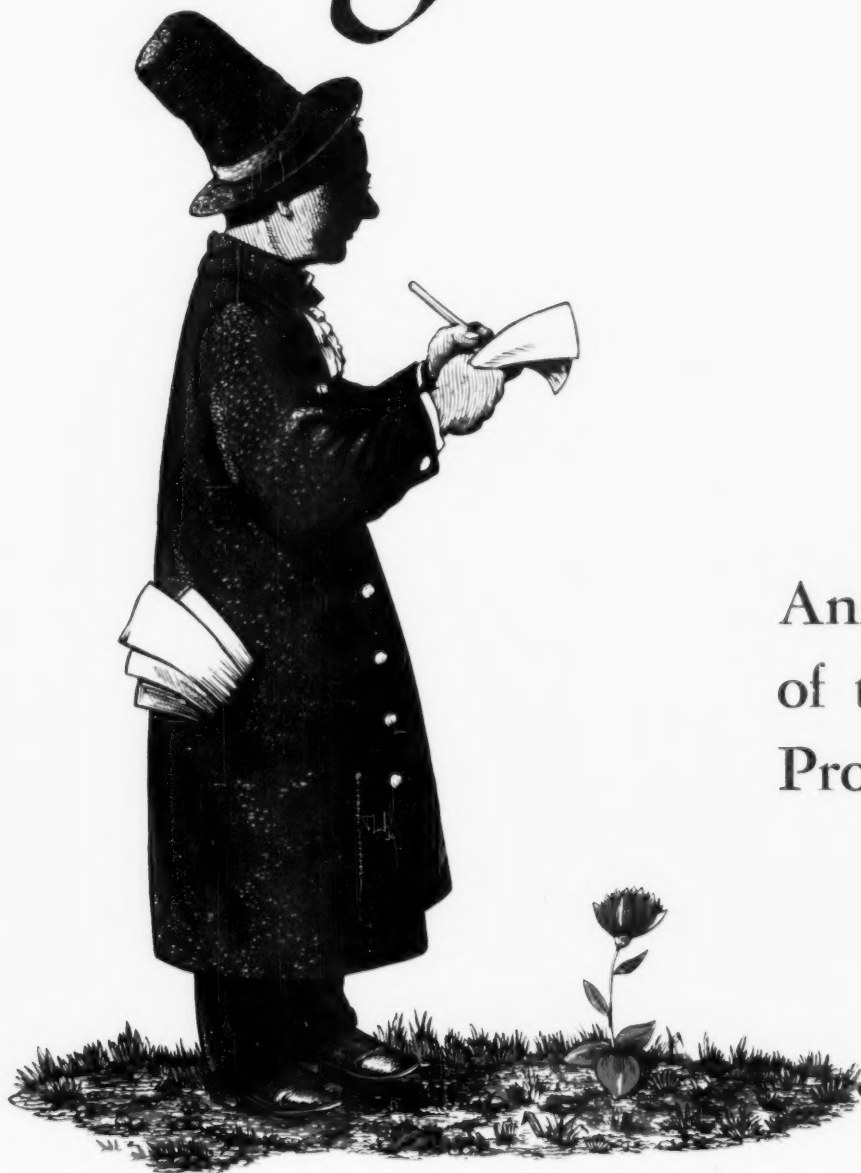


Consulting Engineer

JANUARY, 1958



Annual Survey
of the
Profession

*Valves
for Power
Plants*



Fig. 1314 A—1500-Pound
Integral bonnet steel "Y" Valve.

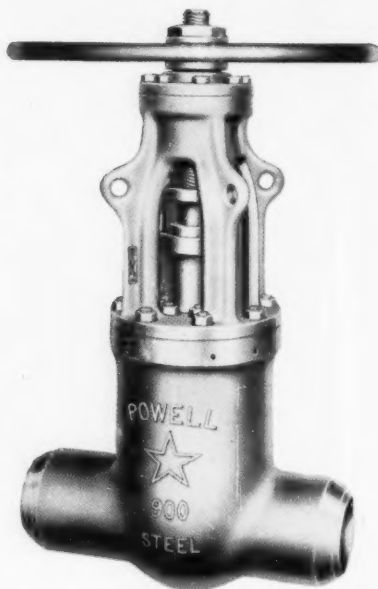


Fig. 19003—Powell Steel Pressure
Seal Gate Valve for 900 pounds W.S.P.



Fig. 375—Bronze Gate Valve
for 200 pounds W.S.P. Union
bonnet, inside screw rising stem.

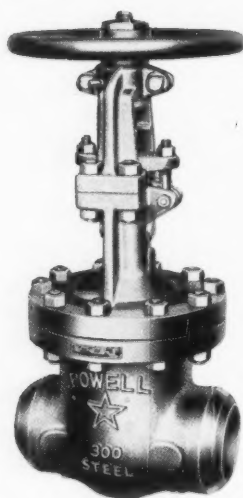


Fig. 3003 WE—Steel Gate Valve for 300
pounds. Outside screw rising stem and yoke.

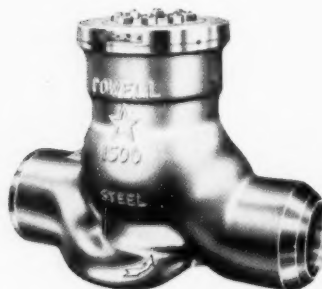


Fig. 11365—Steel Pressure
Seal Horizontal Lift Check
Valve for 1500 pounds.

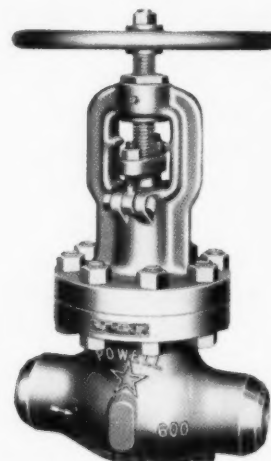


Fig. 6031 WE—600-Pound Steel Globe Valve
for steam service. Outside screw stem and yoke.

POWELL...

world's largest family of valves

FOR EVERY FLOW CONTROL PROBLEM Powell offers more kinds or types of valves, available in the largest variety of metals and alloys, to handle every flow control requirement. Your local valve distributor will be glad to tell you all about them. Or write to us for the full facts.

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MR. ENGINEER:

LET'S FACE THE FACTS...

How can an
underground piping system
be watertight when
you can't **AIR TEST** it?

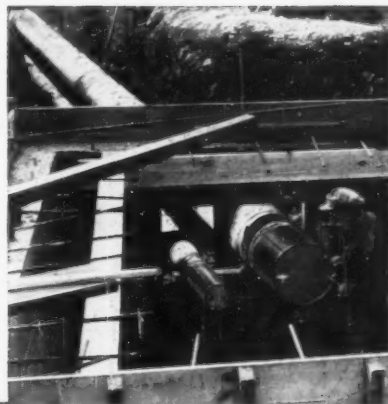
WITH

Ric-wil

YOU can **AIR TEST** your system...

The Ric-wil method of making full-welded field closures allows the installer to **AIR TEST** the system prior to completion and backfilling. This simple 15 lb. pressure test gives greater assurance of a tight, leak-proof system. It provides the finest practicable protection to the owner against an initial system failure ...and most important, the long range effects of water corrosion.

Ask a Ric-wil field representative for detailed information regarding Air Test procedure or write for catalog covering recommended field installation details ... and remember, it pays to do it **RIGHT** the first time ...

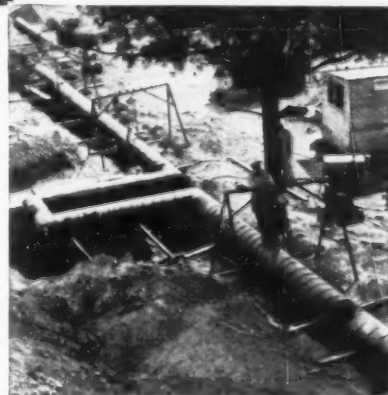


Test caps applied to unit ends for air testing full-welded conduit system.



During air test, conduit field welds are checked with soap solution.

Tested and ready for lowering long lengths.



Quality Piping Systems...

... of Exceptionally High Thermal Efficiency

SINCE 1910

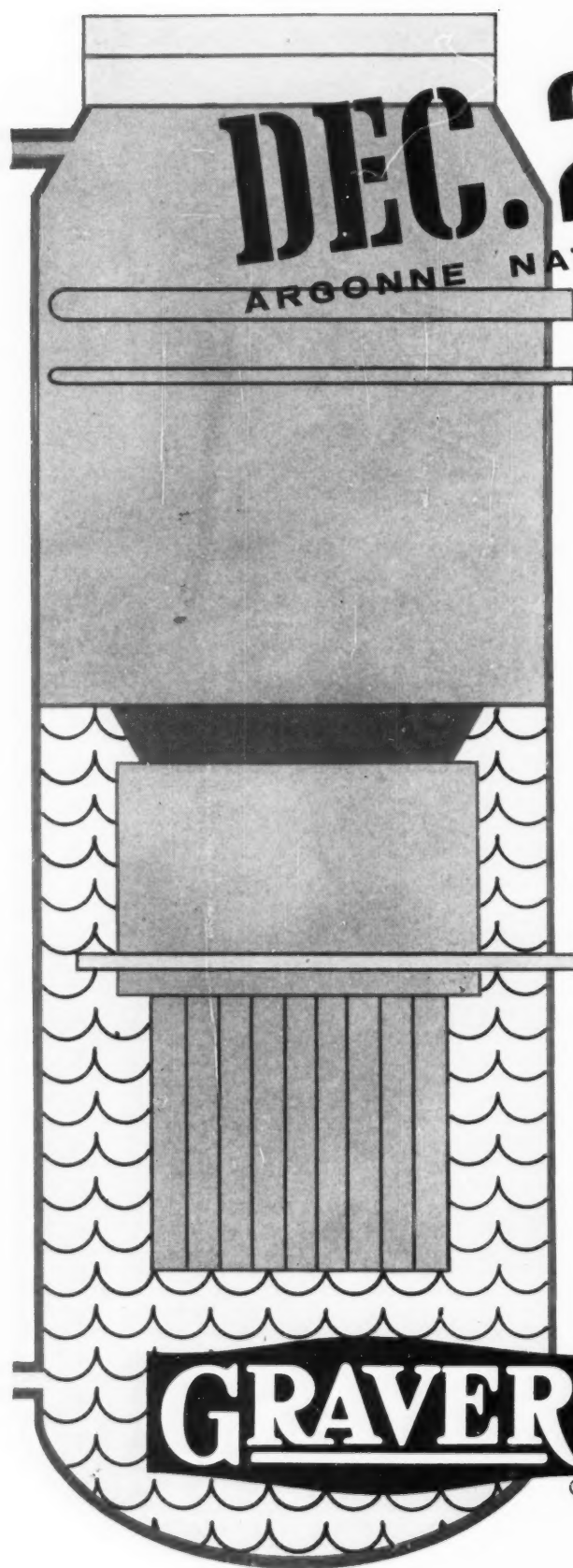


PREFABRICATED INSULATED PIPING SYSTEMS

BARBERTON, OHIO

IN CANADA: THE **RIC-WIL** COMPANY OF CANADA LIMITED





DEC. 29, 1956
ARGONNE NATIONAL LABORATORY

A date long to be remembered as a milestone in our expanding nuclear technology. On this day, after many months of scientific investigation, planning and construction, the Experimental Boiling Water Reactor reached full power generation.

This reactor, dedicated to the peace and prosperity of mankind, employs a promising new system for the generation of power from nuclear fuels. Operating on a direct steam cycle, it eliminates the need for intermediate heat exchangers and permits operation of the reactor at a pressure no higher than that required for the turbine generator system.

The primary advantage of this "direct-boiling" reactor is the simplicity of the reactor itself and associated power system. In the simplest terms, the reactor is operating as a boiler. Nuclear energy liberated by a chain reaction heats the uranium metal fuel plates, which, in turn, transfer the heat to the water around them. This is diagrammatically shown in the sketch at left. Part of the steam produced, at the proper pressure, is used for the generation of electricity.

The continuous removal of corrosion products from the water in the reactor vessel is the function of the reactor purification system. This all-stainless steel system removes water from the bottom of the reactor and, after cooling, delivers it to the ion exchange columns. The resin exchange beds remove all ionic impurities. Purified water is then pumped back with the feedwater. This ion exchange system consists of two Graver rubber-lined, mixed-bed units, 20" dia. x 84" high, having four inches of lead shielding and weighing about 18,000 pounds each.

Graver also furnished a second separate ion exchange, or demineralizing, system for the treatment of makeup water. That system has two rubber-lined, mixed-bed units, 24" dia. x 9'0" high, and a complete regeneration arrangement.

Although only a small part of an important project, both of these systems had to meet the extremely high requirements of engineering, construction and performance required in all Atomic Energy work—another example of Graver's high engineering standards for water treatment equipment.

Industrial Department: I-311

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Division of Graver Tank & Mfg. Co., Inc.

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Consulting Engineer

The Consulting Engineer's Professional Magazine

Wayne near Pleasant Street
Saint Joseph, Michigan

January, 1958 • VOLUME X • NUMBER I

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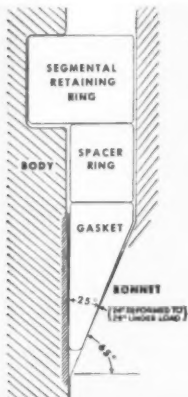


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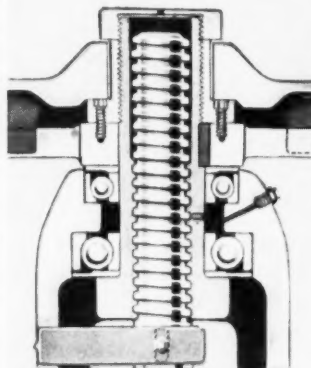
How To Get SPECIAL Features

Tips on selection, installation and operation of steel



NON-LEAK PRESSURE-SEAL BONNET JOINT

By changing bonnet-gasket angle from 45 degrees to shape shown, sealing area is increased 300%, sealing force doubled. Soft iron gasket is electroplated with a lead alloy which flows under pressure, assures tight seal. No sharp gasket edge to damage. Easily disassembled.

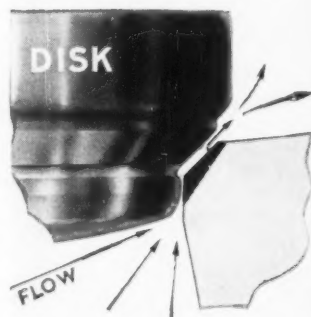


EVALTHRUST* BALL-BEARING CONSTRUCTION

This patented ball-bearing construction is found in all large, high-pressure Edward Valves. Double races on the yoke stem reduce operating torque... effectively transmit highest closing torques. An Edward "exclusive."

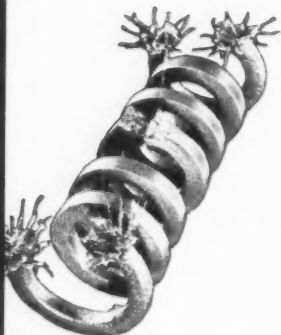
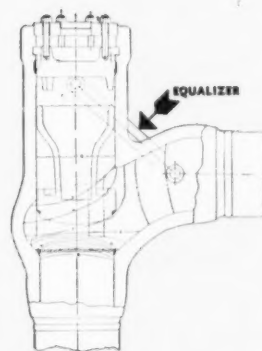
LEAK-PROOF INTEGRAL SEAT

Integral Stellite seat in Edward Valves cuts maintenance, prevents leakage between seat and body. For perfect alignment, applied Stellite is precision-machined in same set-up as body bore, then carefully lapped to form drop-tight mated seating surfaces.



ORIGINAL-DESIGN EDWARD EQUALIZER

For check and non-return valves, the Edward Equalizer connects the high-pressure area above disk-piston with the high-velocity, low-pressure area in the valve outlet. Increases disk lift, cuts pressure drop, reduces disk vibration.



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Rockwell-Built Edward Valves

*Reg. T.M., Edward Valves, Inc.

in **STANDARD** Steel Valves

valves from Edward, long-time leader in the field

We all know that no one gets "something for nothing." Yet, by careful evaluation and selection, it is possible to obtain "special" features in *standard* steel valves. The secret lies in buying "by company" as well as by price. In dealing with Edward, whose products have been the industry's standard of excellence for years, you avail yourself of three important benefits:

1. access to the results of continuing laboratory research on steel valves;
2. expert assistance on valve selection, installation, operation, maintenance and repair;
3. steel valves which are truly superior in design, function and durability . . . but which are not substantially more expensive than ordinary types.

For example . . . a half-dozen "special valve" features—which are *standard* in Edward Valves—are shown in handy clip-out form on the opposite page. ALL of these features are Edward "firsts" . . . MOST are Edward "exclusives" . . . EACH means *extra value* for you!

We invite you to consult your Edward Valve Representative. He is technically trained, thoroughly experienced, eager to help you obtain the *most* value for your valve dollar. At his disposal—and yours—are the results of substantial investment in steel valve research. Let him *use* those results to solve your problems. A card or a call will bring him "on the double" . . . so make it a point to contact us *now!*

Fig. 7594Y cast steel horizontal check valve. Pressure-seal bonnet construction. Rated at 1500 lb at 850 F.

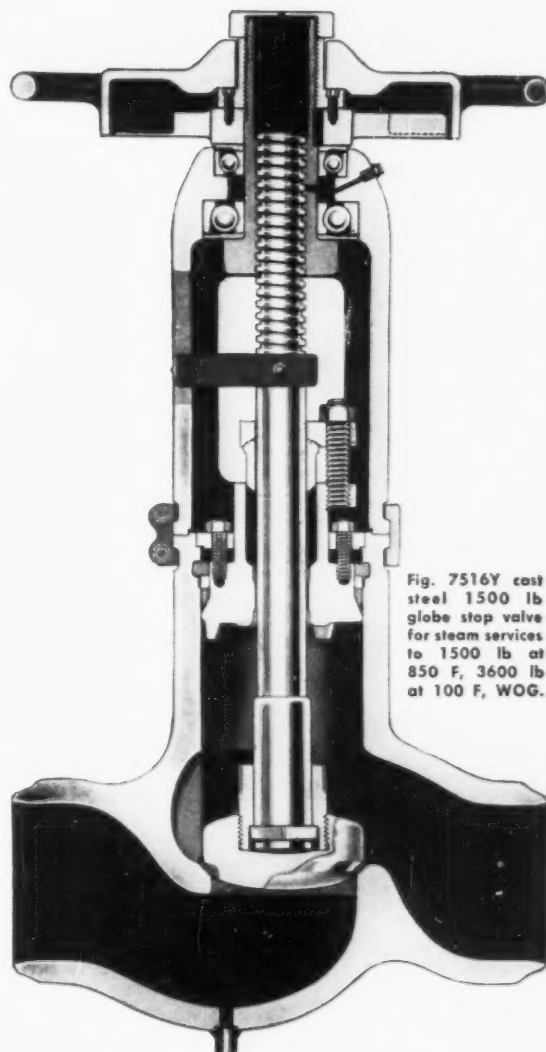
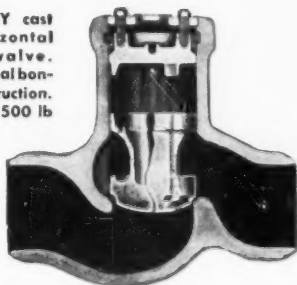


Fig. 7516Y cast steel 1500 lb globe stop valve for steam services to 1500 lb at 850 F, 3600 lb at 100 F, WOG.

Edward builds a complete line of forged and cast steel valves from $\frac{1}{8}$ " to 16" in globe and angle stop, gate, non-return, check, blow-off, stop-check, relief, hydraulic, instrument, gage and special designs for pressures up to 7500 lb with pressure-seal, bolted, union or welded bonnets and screwed, welding, or flanged ends.

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Readers' Comment

Professional Ethics

Sir:

A considerable number of my colleagues have been shocked by disclosures in the anonymous feature of your December issue "I Gave Up Ethics—To Eat!" but it should not be surprising that

highway design work sometimes is obtained through "honest graft." Instead it is a natural development, highways being furnished for the benefit of automobiles and transport trucks; ticks on the body politic and economic.

The surprise is that an engineer can claim to offer the best possible engineering (ethics) after obtaining the work through use of unethical practices. It would seem that the logical next step after buying a job is to absent oneself while a favored contractor substitutes political hot air for Portland Cement, and makes unauthorized profits by omitting steel. Man cannot serve God and mammon, and ultimately the point is reached where engineering and politics are diametrically opposed, and a decision must be made to adhere to the one or to the other.

There are degrees of theft; self-prostitution, like murder, tends to be absolute. My own net worth might be a few dollars higher had I submitted to the dictates of political engineering in a number of instances, but for twenty years conscience would have been unendurable. I still respect the civil engineer, known in my youth, who became disillusioned with graft in construction, and returned to his hometown where the rest of his life was spent as surveyor.

A man need not yield, unless he wants to. After 1900 years of alleged Christian civilization, have we less knowledge than the ancients concerning good and evil? A moral code was followed by Xerxes. Macaulay tells of the Ro-

man Virginius who deemed that death was preferable to concubinage for his beloved Virginia. Many women have had the desire to eat, but not all have become harlots.

E. F. Downs
Engineer-Statistician
La Grange Park, Ill.

Sir:

Congratulations to CONSULTING ENGINEER for "I Gave Up Ethics—To Eat!"

The engineering business, or profession, if you wish, takes a forward step when an article like this is published.

Engineers and scientists must take a more aggressive interest in politics, rather than ignoring, or bemoaning, same.

J. Mahoney
Consulting Engineer
New York, N. Y.

Sir:

I read your article entitled "I Gave Up Ethics—To Eat!" in the December 1957 issue with great interest.

I have recently started my own consulting engineering firm and have made no progress with public officials—municipal, state, and federal.

In all cases, when I have a meeting with these individuals and present my engineering qualifications there is no question but that my firm is able to handle the work. At all times I am received in a very friendly and courteous manner, but absolutely nothing has ever materialized. Although there is no proof, I have the impression that obtaining work is completely dependent upon employing the procedures described in this article. I have heard that the first thing a state highway department does is to review the campaign contribution list. If contributions have not been made, the consulting engineering firm is not considered for the work.

I have often wondered whether it would not be better to have en-



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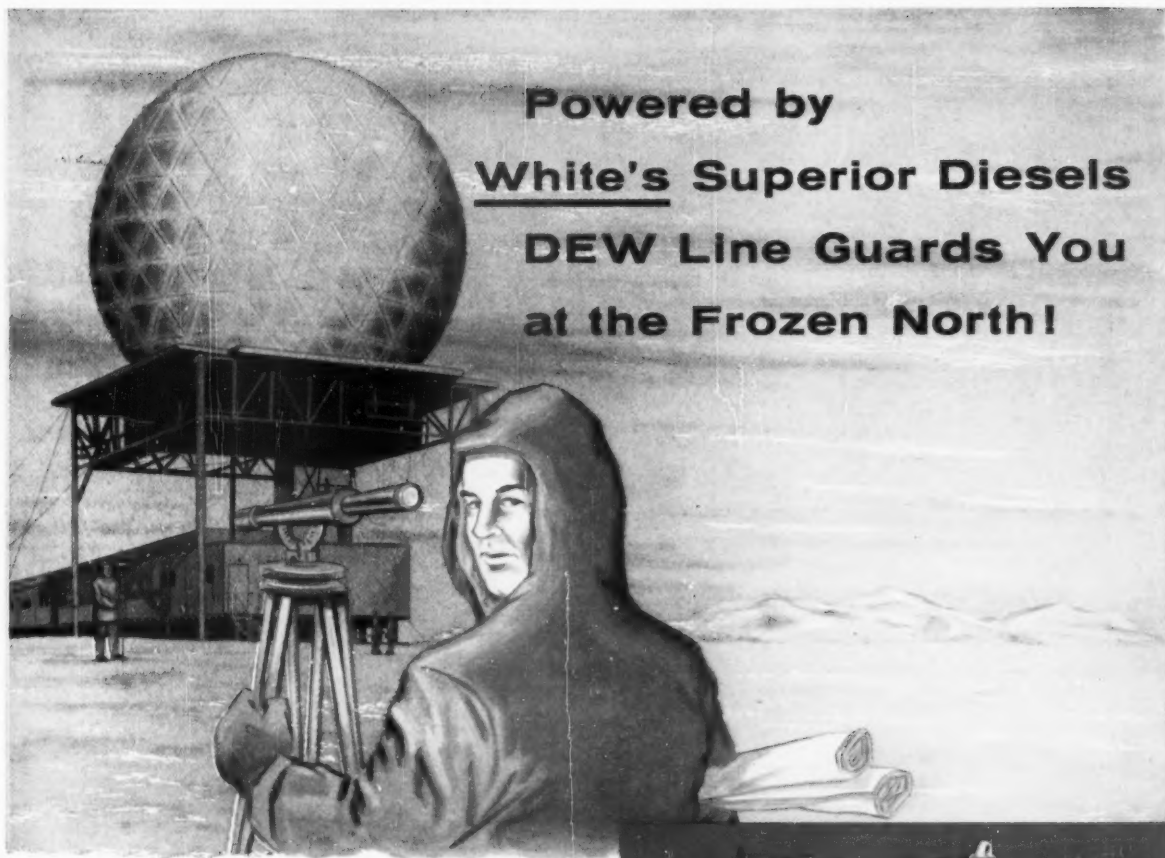
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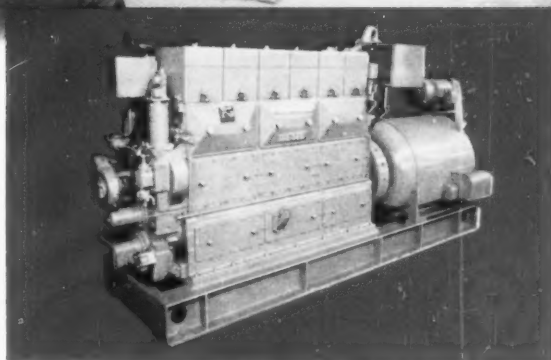
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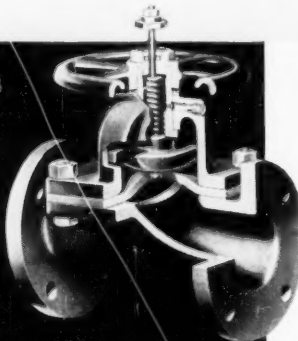
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gineering services performed on a competitive basis and thus keep the entire procedure honest, rather than to fool ourselves with a high sense of morality and pay graft on the side.

Your publication is to be complimented on having the courage to print this article.

Another Anonymous

In Defense of Educators

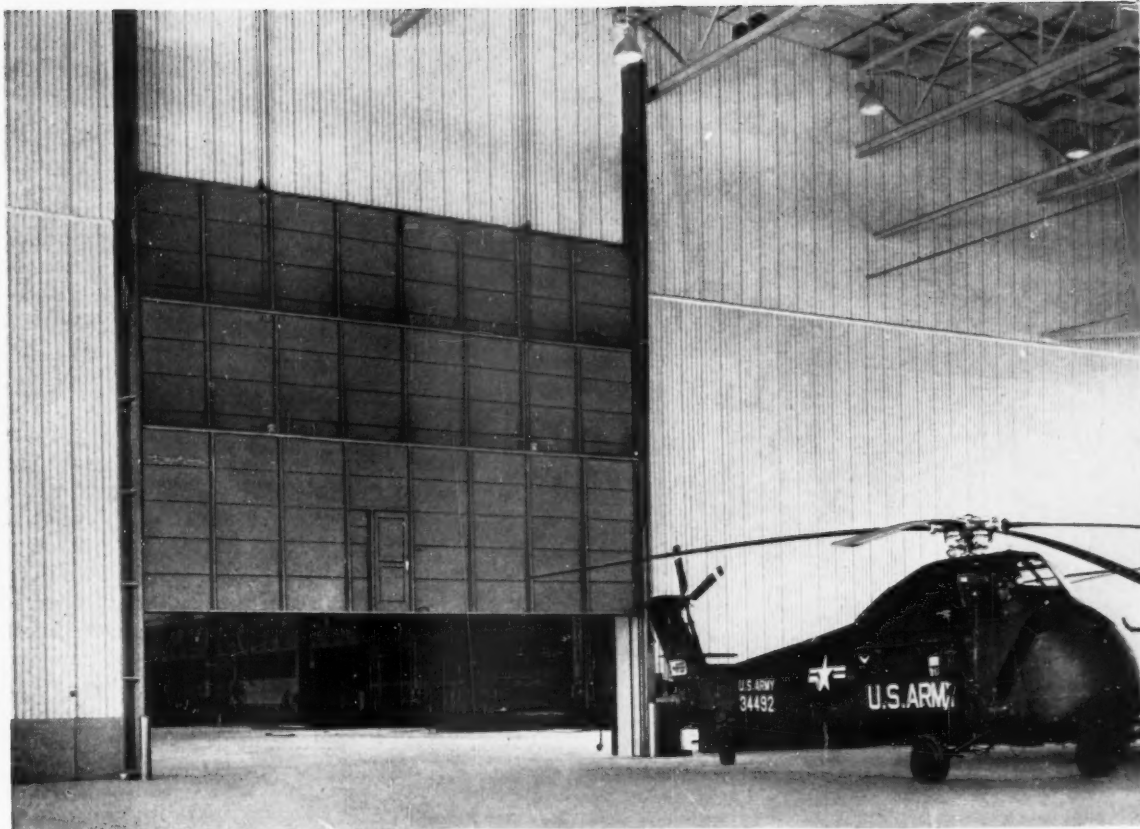
Sir:

Your November issue of **CONSULTING ENGINEER** contained a very interesting article on education under "Scraps and Shavings." I would like to offer my comments on the subject.

You were very hard on the educators. Certainly they cannot be held responsible in full for the mess in which our educational system finds itself. We are each one of us at fault because of our apathy and general complacency along these lines. The necessary steps that can be made to alter the situation are very complex, but, of one thing I am sure, that articles in publications such as yours are a step in the right direction. Perhaps if enough of us realize the deplorable situation, some of us will act in an effort to solve the problem.

We as consulting engineers design the heating and ventilating systems to the best of our ability to insure the comfort, health, and well-being of students in our modern schools. But unfortunately most of us stop there. We are too busy, or so we think, to be interested in curriculums, teachers, extra activities, educators, and the like.

Under our compulsory education laws, too many youngsters think of school as an interim between childhood and adulthood. A period to be lived with as little effort as possible. As humans, they seek the easiest path, and unfortunately our school counselors and parents permit them to do so. Students are permitted great latitude in their choice of



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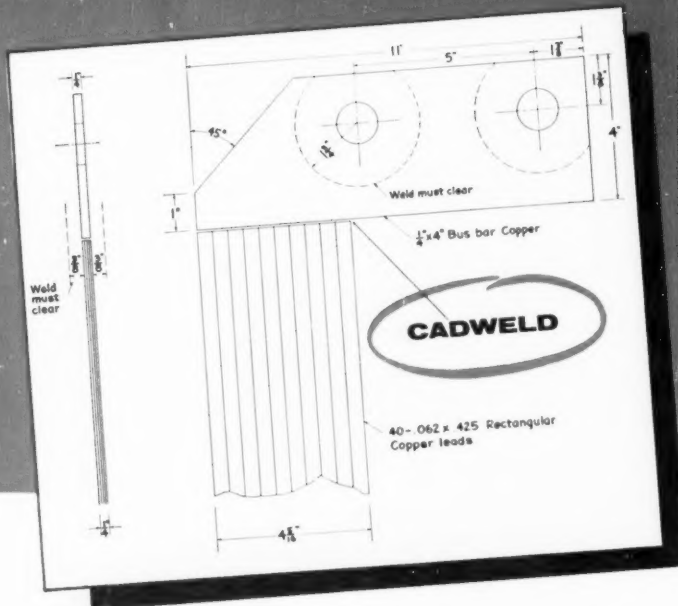
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subjects ranging from fish raising to modern dancing. These courses do not aid in the learning of the alphabet. Deviation from the three R's is commonplace. Emotional development is emphasized too drastically. There must be a happy medium between emotional development and intellectual instruction. Emotional stability is a compromise between learning, parental guidance, and physical training.

The recent developments of "Sputnik" and "Muttnik" have, it seems, opened the eyes of our governmental officials that we are in great need of scientific minds — minds that must be developed over a long period of time through our educational systems. We have in this country all of the necessary facilities, the finest schools in the world, and I am sure we have potentially the greatest scientific minds on earth.

Edward P. O'Brien
Consulting Engineer
Cleveland, Ohio

Engineers and Foreign Aid

Sir:

Some element or segment of what we refer to broadly as the engineering fraternity should do something of dramatic effectiveness to carve out a position of prominence in our Government's Foreign-Aid Program.

The need is leadership. This leadership could be supplied by an engineering society or by a publication devoted to affairs and activities of professional engineers.

Even the politicians are inviting engineers to step into the foreign aid picture. Let me invite your attention to the "Foreign Aid Report" of the Senate's Special Committee to the Study of the Foreign Aid Program. Senate Report #300.

The report is critical of the conduct of our Government's aid effort and, in particular, the shortcomings of the International Cooperation Administration. The Committee attributes the weak-

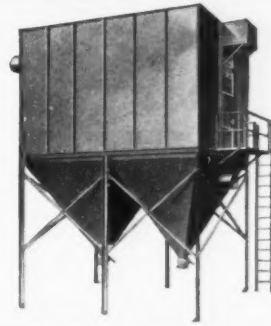
there is a Dracco unit



Whirl-Clones answer the need for efficient cyclone-type collection. Widely used with high temperatures, corrosive materials or large particle sizes. Dracco design assures efficient separation in units to 8-foot diameter. Welded construction assures minimum wear and long life.



Uni-Filters can be located at dust sources for efficient control with lower piping and power costs. Compact self-contained units with capacities from 300 to 1800 cfm require little space, are shipped ready to install and can be easily relocated.

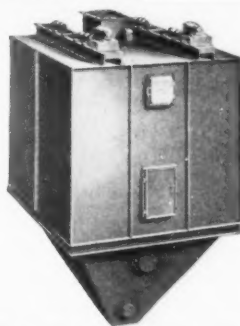


Multi-Bag Filters, basic Dracco unit, combine moderate cost with multi-duty versatility. Compact, space-saving housing can be installed inside or outside, contains unusually large cloth area. Models for intermittent or automatic, continuous service in wide size range with unsurpassed efficiencies.

to solve almost every



Dustomatic Filters are designed for continuous dust and fume recovery under heavy-duty conditions such as non-stop operation, high temperatures, heavy dust loads and high static pressures. Often used as integral part of chemical and metallurgical process equipment.



"DH" Filters are probably the finest units for automatic dust collection under severe conditions. Extremely rugged, they collect heavy, dense or sticky dusts that cannot be handled any other way. Well worth their extra cost because of their high capacity-to-size ratio.



"X" Filters, soon to be announced, will provide the long-sought answer to high-efficiency collection of hot or corrosive dusts and fumes. These advanced-design units are now being extensively field tested at temperatures to 600°F.

dust or fume problem

This extensive equipment line plus Dracco's 40-year reputation for solving the toughest dust problems are sound reasons for talking to Dracco first.

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DRACCO airstream conveyors
dust control equipment

Executone gives you **4-way service** for sound and intercom systems!

We provide not only wiring plans, shop drawings, specifications and costs, but with our nation-wide organization of exclusive distributors we also give your clients on-premise maintenance of equipment and instruct their personnel in its proper use. If you have a job on your boards that should utilize intercom or sound, you should be familiar with these four important Executone services:

Not only this...

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Executone's Field Engineers will assist you in determining your clients' communication needs... recommend the system designed for the job... provide you with a professional consultation service.

- 2 Installation and Supervision**
Each local Executone distributor is prepared to take full responsibility for the final and satisfactory operation of the system, whether installed by the contractor, or his own factory-trained crew.

But also this!

- 3 On-Premise Maintenance**
Each local distributor is staffed with skilled, factory-trained technicians. They also have complete stocks of standard replacement parts. Continuous, uninterrupted performance of every Executone system is assured.

- 4 Personnel Instruction**
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nesses of the program to: inadequate coordination of aid programs; ineffective personnel and contracting policies of the International Cooperation Administration; and deficiencies in the operation of country programs (a responsibility of ICA).

In supporting the continuance of foreign aid, the Committee recommends that greater use be made of private firms to carry out aid programs, it being the view of the Committee that this device makes possible the employment of able personnel.

The Committee report endorses the Technical Assistance Program of ICA. The position of the Senate Committee appears to be that more technical assistance and less direct dollar gifts is the key to an effective Foreign Aid Program.

Let me invite your attention to that internal area of ICA which is responsible for the Technical Assistance Program. This activity is centered in the Office of the Deputy Director for Technical Services.

The Deputy Director is Edwin H. Arnold, a well known engineer who was in my class at MIT.

The Assistant Deputy Director is C. W. Flesher, an experienced and capable engineer, who was moved over to ICA from the Engineering Departments of the World Bank and the Atomic Energy Commission.

The Director of Industrial Resources, the largest operating unit under Mr. Arnold, is Carl Giroux, an engineer who joined ICA early this year upon leaving the highest civilian position in the Corps of Engineers with the title of Special Assistant to the Chief of Engineers.

If it is a fair question, I would like to ask what organized moral support on the part of the engineering profession, either through a professional society or an engineering publication, is being extended to these gentlemen? Their's is an important job. They hold the key to the success of an important undertaking of the

Continental Boiler Service Coast to Coast



The basic fundamentals of learning are the ABC's. Therefore, when your subject is boiler service — Continental Boiler Service — we believe it essential that you become familiar with the ABC's of Continental Service from coast to coast as follows:

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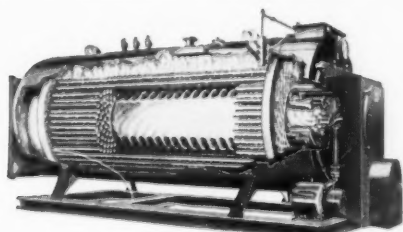
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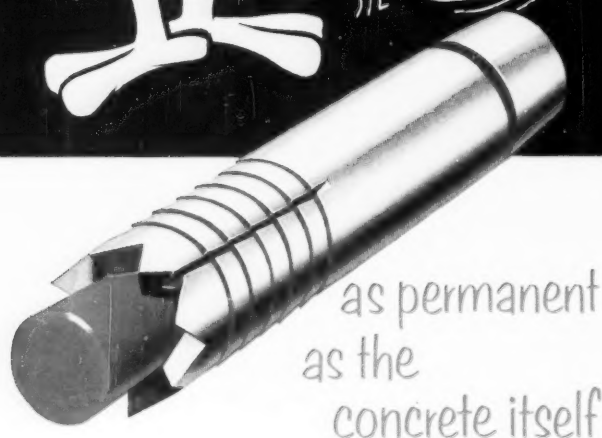
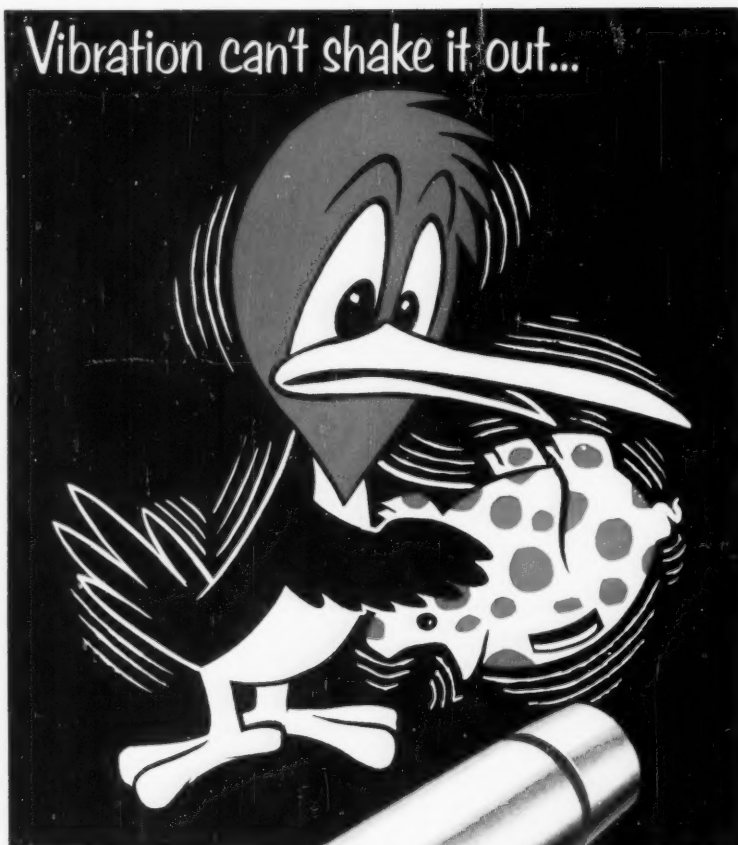
The Continental AUTOMATIC BOILER



Cut-away view of typical Series A Continental Automatic Boiler, firing oil and/or gas. Other models from 20 to 500 hp, with on-off, low-high-low or modulating controls. For steam heating or process work at pressures from 15 to 250 pounds, or for hot water heating at low or high temperatures.

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United States in our effort to strengthen the free world. Other segments of our Federal organization attract the support of private enterprise elements of our economy. For example, the Secretary of Commerce can count on industry generally for back-up support of his undertakings.

Where is this "industry" type of back-up for Ed Arnold and his immediate staff in this largest of engineering undertakings — the multimillion dollar Foreign Aid Program?

Ray C. Burrus
Associated Consultants, Inc.
Washington, D. C.

Errata

Sir:

On Page 170 of the September 1957 issue of your magazine, there is an article entitled "Tri-Dam Project Dedicated." Your article reports "The Tulloch Dam power generating equipment furnished by S. Morgan Smith and Westinghouse will consist of two, 12,000-hp, 153-ft head Francis type hydraulic turbines direct connected to 240-rpm generators to provide 17,000 kilowatts."

The reference to Westinghouse furnishing the generators is in error. The two, 9500-kva, 240-rpm vertical generators were furnished by Elliott Company and are now in service . . .

W. P. VanVranken
Sales Department —
Ridgway Plant
Elliott Company
Ridgway, Pa.

Hope for Us

Sir:

Your magazine is not really very good yet but I have hopes for it as the field covered is tremendous and it can serve as a medium to broaden our education and cross-fertilize us with other disciplines.

Dr. Rolf Eliassen
Consulting Engineer
Winchester, Mass.

CONSULTING ENGINEER



Developed by ALCO thermal engineers, this sine-wave tube configuration has pioneered atomic heat-exchanger design.

THE NEW SHAPE OF THERMAL EXPANSION

Some heat exchangers in atomic power plants are exposed to tremendous fluctuations in temperature. This means, of course, that unusual expansion characteristics must be provided. ALCO engineers have answered this need by designing a unique sine-wave tube that eliminates expansion joints and floating tube-sheets.

Originally designed for America's first atomic submarine, the *Nautilus*, this new concept is currently being applied in other ALCO heat exchangers for major nuclear power plants. The design itself is simple, but it safely

absorbs thermal and shock loads through the flexing of the tubes' sine-wave bends.

This new shape of thermal expansion is typical of the advanced design concepts that ALCO builds into all its heat transfer equipment. As a leader in heat exchangers for the power industry, ALCO is now pioneering in the field of thermal engineering for the atomic industry.

For complete information, contact your nearest ALCO sales office or write: ALCO Products, Inc., Dept. 133, Schenectady, N.Y.

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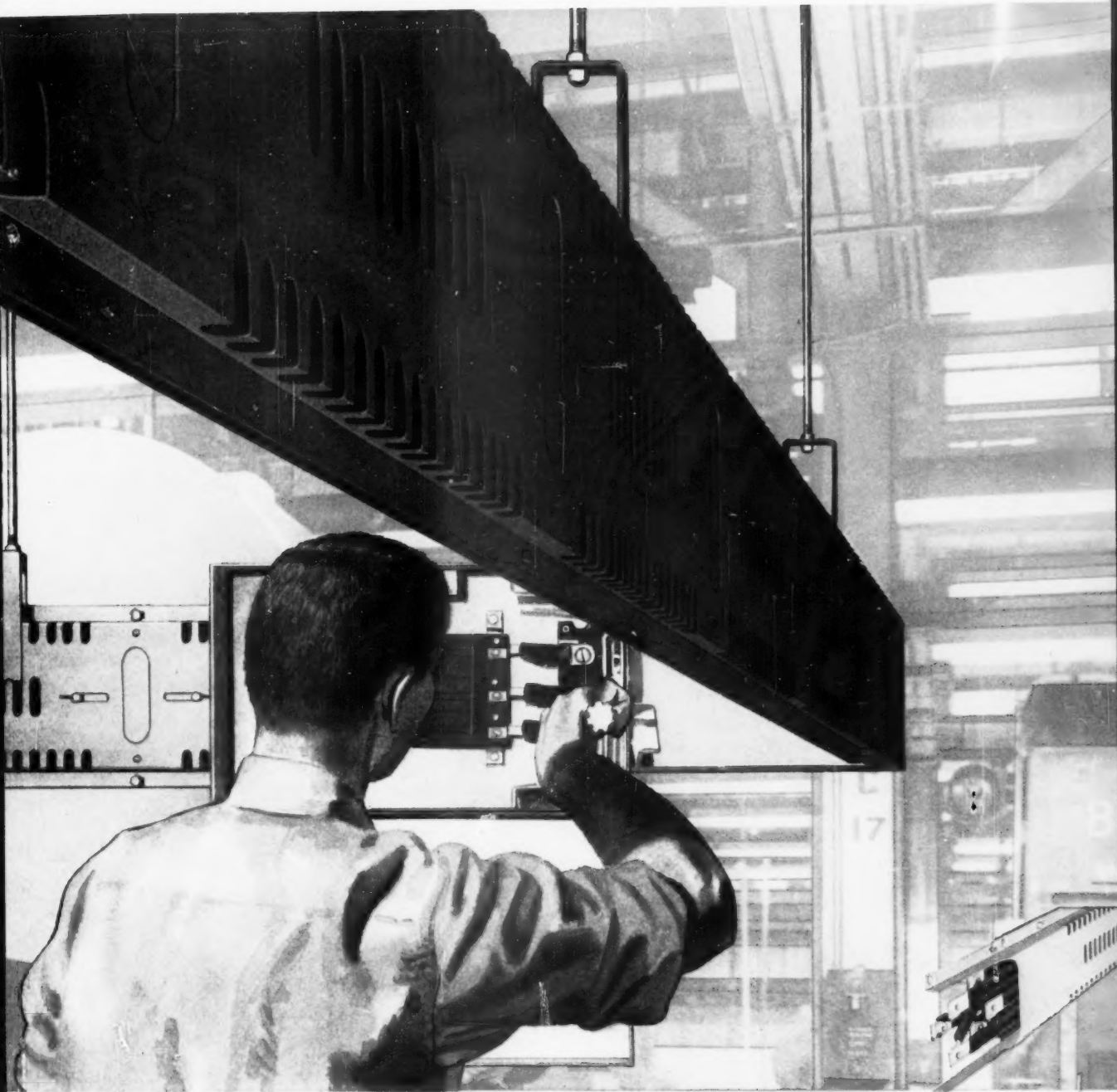
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workers and management EXTRA protection*



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The most efficient bus duct in the world is no bargain if it's not absolutely safe. But . . . here's a busway that's both highly efficient *and* safe. Westinghouse Life-Line® bus duct!

Westinghouse Life-Line bus duct combines cost-saving low impedance characteristics with plug-in convenience—and gives you an all-important extra dividend—a foolproof interlocking safety slide that eliminates exposed live parts.

There's not a chance of touching a hot

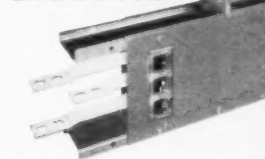
part, even when installing plug-in devices. *Every* part of the plug-in device is electrically dead, even after it's been mounted on the duct—until the cover has been closed, the contact handle turned to ON.

Of course, Westinghouse Life-Line bus duct has all the features that *make* bus duct so desirable: light weight; quick and easy installation; flexibility to accommodate growing power demands—and—*important cost savings* on many jobs.

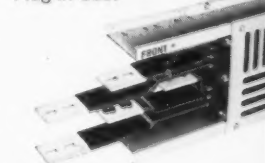
For more detailed information, contact your nearby Westinghouse sales office or write: Westinghouse Electric Corp., Standard Control Division, Beaver, Pennsylvania.

J-30287

Life-Line bus duct

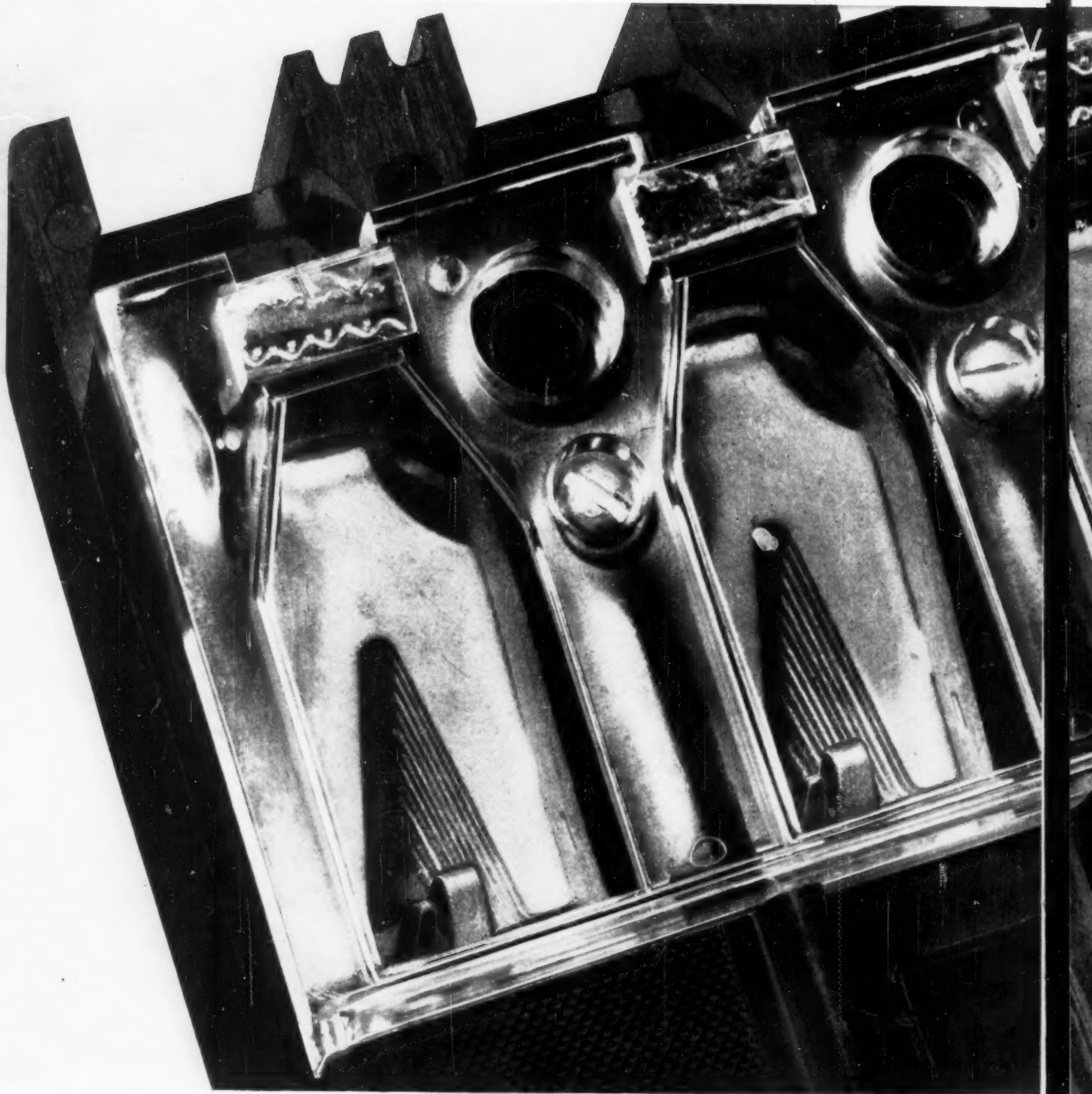


Plug-in duct




Low Impedance duct

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with the Contacts VISIBLE**



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SAF-T-VUE

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Everyone who's seen this exciting new development has said "this is the biggest thing in circuit protection since the development of breakers . . . you're sure the contacts are open (or closed) because you can see through the transparent window."

Of course they're right, and in addition, Westinghouse Saf-T-Vue Breakers have the positive action, tested accuracy, long life and special features that engineers, manufacturers, electricians and contrac-

tors have depended upon for years. Now plants whose safety codes require that contacts be visible can use the most modern form of circuit protection.

See your Westinghouse representative, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pennsylvania.

J-30286

YOU CAN BE SURE...IF IT'S Westinghouse





Scraps & Shavings

IT HAS BEEN A FINE five years — these five years since the publication of the first issue of **CONSULTING ENGINEER**. A lot has happened to the profession and to this magazine.

The profession has grown, and so have we. Figures show that there are now about half-again as many engineers in private practice as there were five years ago. Our circulation list has grown correspondingly. We now have ten thousand consulting engineers and top employees of engineering firms receiving this magazine each month.

Your firms have grown in size, too, during this period. No figures show how much, but you need only look at your own firm and the one across the street to know that the profession is using more men on more projects.

This magazine has grown apace. In our first six months of publication we averaged 30 pages of advertising and less than 82 total pages to the issue. During the past six months, we have carried 122 pages of advertising and better than 208 total pages per issue.

Growth cannot be measured entirely by numbers. The fact that the private practice of engineering has increased, when counted in numbers of firms and dollar volume of projects, is no proof of true professional growth. Growth also must be measured by ethical standards and by levels of technical competence. Professional development cannot be calculated with statistical data and an adding machine. These measures you must take for yourself.

It is faulty, too, for us to measure the growth of this magazine only with figures of increased advertising lineage or circulation. There is more to a magazine than that. A good magazine must be both a mirror and a lens. As a mirror it must reflect the truth about things as they are. As a lens, it must focus on worthy objectives, pointing the way for its readers.

These goals are limits that can only be approached. But when we look back at the early issues, five years ago, we do know that we have made progress. In those days we knew few consulting engineers, and we knew little enough about even those. We then knew nearly nothing of the way consulting engineers thought, felt, or acted. Today, we know many engineers in private practice. We know much about how they think, feel, and act. We are closer to the profession than any other publication.

Still we know we have learned but a little. Even now we know personally only a small fraction of our readers. Our reporting can be faulty and our efforts to guide feeble.

Five years from now we hope to be doing a better job for the profession. We hope we will know more of you personally and understand more fully your aspirations. We hope that occasionally we can lead as well as report.

We will try to become both your Boswell and your Burke. ▲▲



Gary

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Gary welded grating installations cost less because you eliminate expensive alterations and piecing together on the job. Gary installations look better too. All members line up perfectly for that "tailor made" look. Cutouts and other details that take so much longer to do in the field are completely finished at the factory. Gary welded grating, designed for specific loads and deflections, is as easy to specify as it is to install.

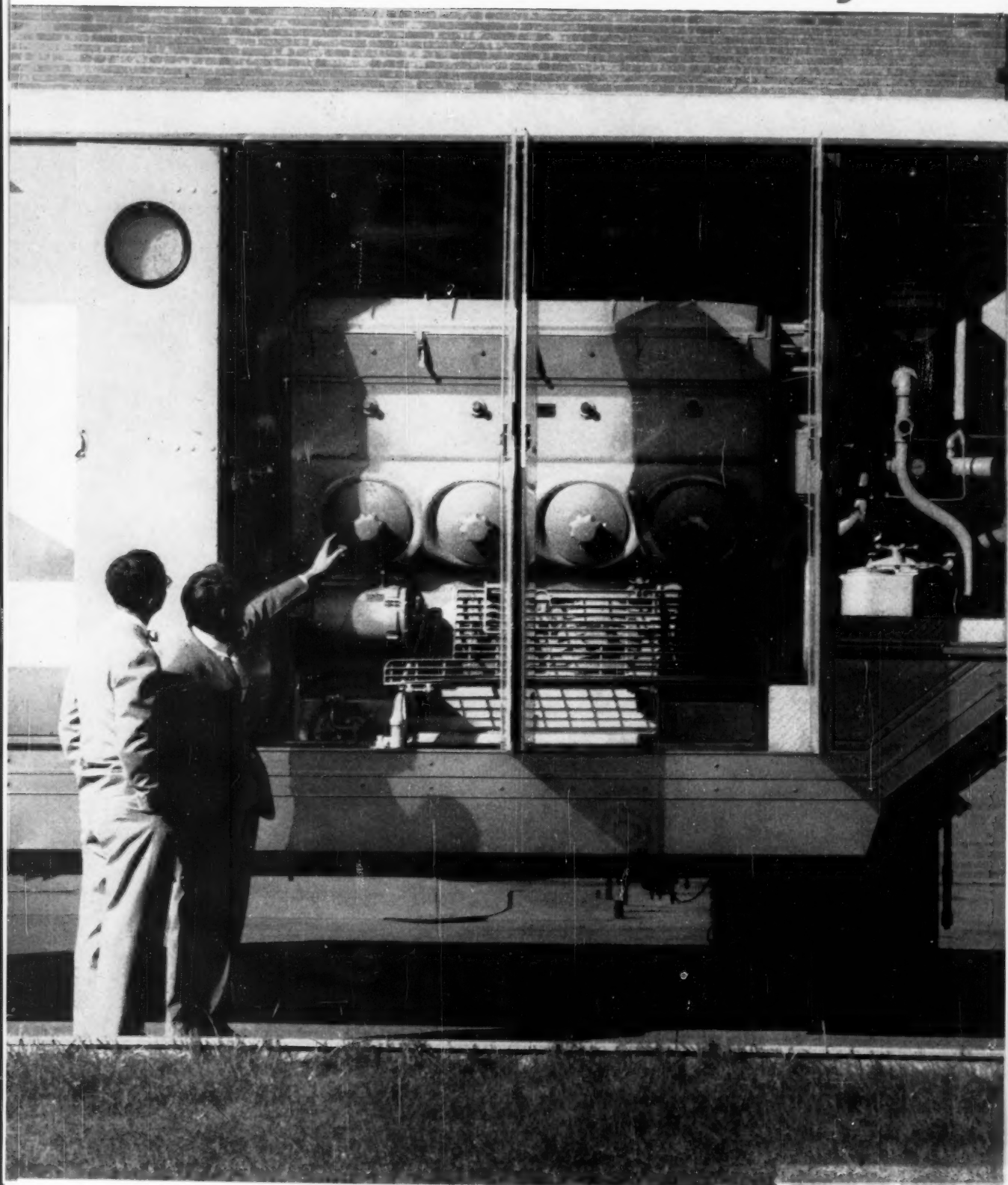
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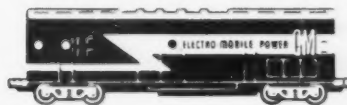
produce electric power

The Diesel engine was first designed and built for mechanical drive. It was much later that Electro-Motive incorporated this principle in designing and building a prime mover specifically for electric power generation.

It was, in fact, in 1932 that two experimental electric power generating sets were tested at the Chicago Century of Progress Exposition. These two cycle engines were a revelation in design—compact and lightweight.

Refined and improved over the years, this advanced prime mover has been produced in quantity by Electro-Motive—enough, in fact, for a total generating capacity of more than 24,000,000 kw. Above all, this engine has proved its dependability, operating for thousands of hours under every conceivable condition with only the most routine type of servicing.

It is this wealth of tested and proven experience that is your best assurance when you install Electro-Mobile equipment. Why not discuss its potential for low load factor generation with your Electro-Motive representative?



1000 kw units for use on sidings or placed on piers for semi-permanent use.



500 kw units offer excellent mobility for many temporary applications.



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The Word *from* Washington

EDGAR A. POE
Consulting Engineer Correspondent



RUSSIA'S dramatic satellite program not only has quickened the pace of the Eisenhower Administration, but it has had the effect of increasing the importance and stature of engineers and scientists. There appears to be no doubt in official Government circles that their professional stock will continue to rise at this rapid pace.

The White House has directed the Civil Service Commission to raise salaries of engineers and scientists to the maximum rates of their respective grades. President Eisenhower has directed, in view of the sense of urgency overtaking the country, that scientists and engineers be given every encouragement in their work and service for the Government.

Many of them are going to receive higher salaries and other benefits. Higher competitive salaries have been recommended by a Cabinet steering committee. In an effort to relieve the shortage of professional people within the Government, the Bureau of the Budget is receiving recommendations designed to alleviate the situation. The series of recommendations perhaps will result in legislation that will be presented to the House Post Office and Civil Service Committee early in the new session of Congress.

MEANWHILE, the Chairman of the House Manpower Subcommittee, Representative James G. Davis, for the second time within a year has called on the Defense Department to more effectively utilize the skills and abilities of its engineers.

The Georgia Democrat said that a spot check indicated that more than a fourth of the engineers and scientists were in administrative and other positions not requiring their professional skills. Once again he reiterated his fear that there is too much competition between departments of the government in employment of engineers and scientists. In the past departmental competition has been responsible for hoarding engineers.

The Army's Assistant Secretary for Manpower, Hugh M. Milton, says the Army is employing 20,600 scientists and engineers. About 11,000 of these are working on the missiles program. Mr. Milton maintains that the Army's most pressing civilian personnel problem is the shortage in these categories.

The Pentagon acknowledges that many engineers

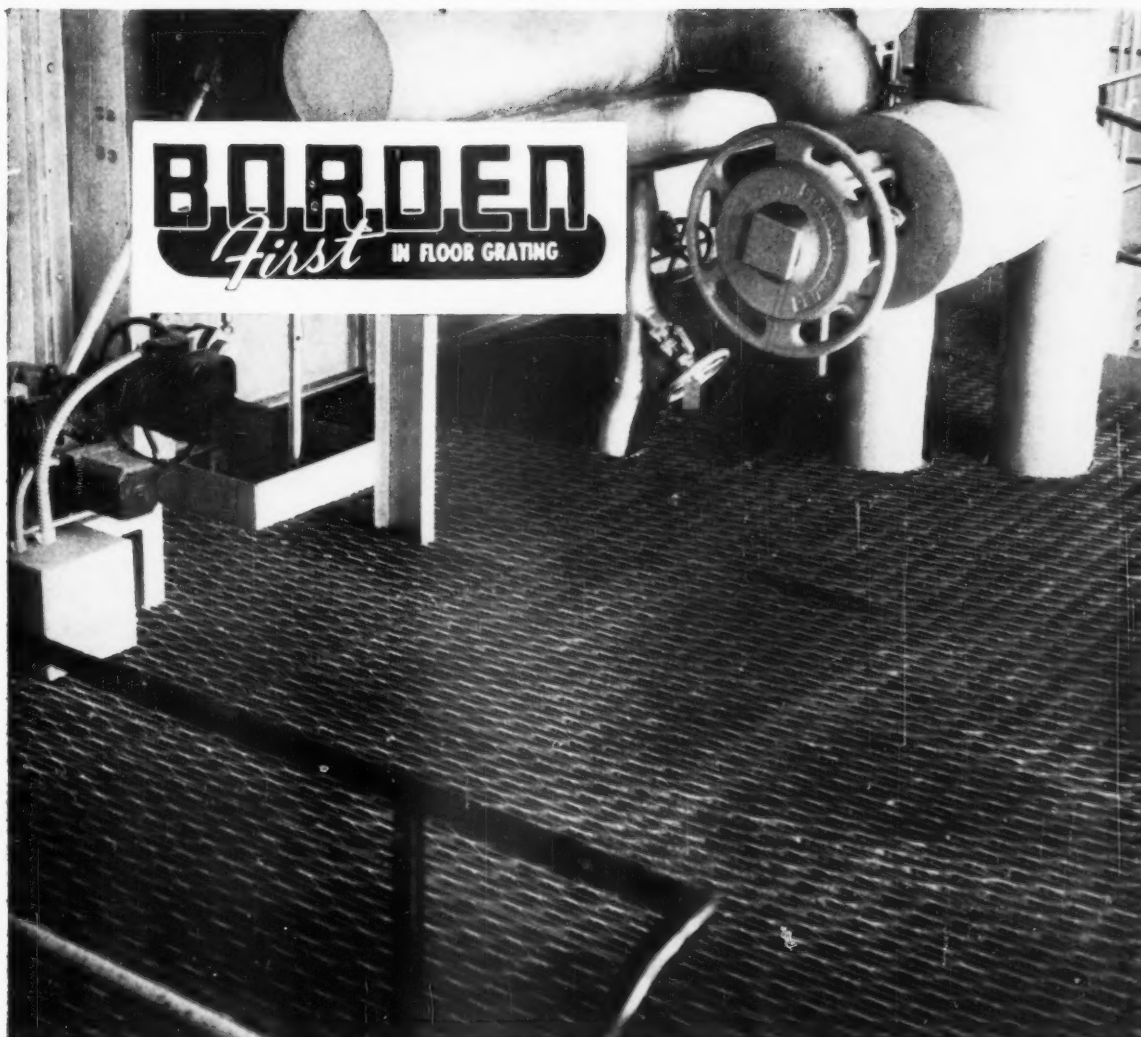
have been temporarily thrown out of work as a result of termination of air craft contracts. When the United States Air Force decided to cancel its financial support of the development of a supersonic nuclear aircraft engine, numerous engineering and scientific teams were broken up. The largest number of engineers affected on a single project was at the atomic research laboratory, operated by Pratt & Whitney, at Middletown, Conn. The Middletown laboratory began operating more than six months ago for the announced purpose of developing a nuclear airplane engine.

THE Interstate Highway Program shows approximately \$3 billion in Federal and state funds now in use. These are projects programmed, authorized for engineering or acquisition of rights of ways, advertised for bids, under contract, or in actual construction. The primary, secondary, and urban programs show an excess of \$2.8 billion in Federal and state funds similarly programmed. The states have obligated some 36 percent of available Federal funds for the interstate program for the current fiscal year, and 35 percent of the primary, secondary, and urban programs.

THE Internal Revenue Service has held that under the amended Revenue Act of 1954 deductible expenses for a business include services performed by a consulting engineer or research done by a commercial laboratory.

A NEW look at housing legislation will be made. Congress, regardless of which party is in power, has enacted housing legislation each year since World War II. About 60 percent of all American families now own homes. More than 5,000,000 veterans have obtained homes with GI loans.

Some of the Government housing authorities believe that the FHA down payment schedule combined with the 5¼ percent interest rate should raise the 1958 starts above the 1,000,000 mark. However, all signs indicate that the homes will cost a little more as a result of higher costs of building materials, increased wages and freight costs, plus higher cost of land. The availability of money will



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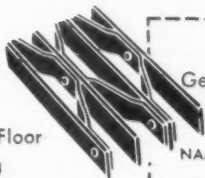
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have much to do with the total number of starts.

The public housing question will come up again. The present program of 35,000 units a year expires in 1958. Also the question of Federal assistance to economically depressed areas will be revived in the new session. The Tennessee Valley Authority wants to issue many millions of dollars of bonds for power expansion in the TVA area. This will evoke controversy before its final fate is decided.

The Rural Electrification Administration says that 95 percent of the nation's 5,000,000 farms now are electrified. The lending agency of the Agriculture Department says REA is serving 4,945,000 consumers on 1,400,000 miles of line in 45 states, Alaska, Puerto Rico, and the Virgin Islands. Although the farm population is now 2,000,000 less than a year ago, the rural population (persons living in communities less than 2500) in the United States is growing. The present rural population is 20,396,000.

PARTISAN politics will influence heavily the activities of the 1958 session of Congress. This is national election year when all 435 House seats are at stake as well as one-third of the 96 Senate seats.

WHILE another scrap looms over proposed Federal aid to states for a school construction program, a long range guess is that the proposal again will be defeated for several reasons including economy, lack of real need, and the segregation issue. Another controversial provision of any construction bill would have to do with whether the money should be allocated to the states on the basis of need or on the basis of school population.

SENATOR Allen J. Ellender, of Louisiana, regarded as the most travelled man in Congress during the past 10 years, spent weeks behind the Iron Curtain and in Russia. An influential member of the Senate appropriations committee, he is strongly advocating an exchange of engineers and scientists between the United States and Russia. He maintains that such an exchange would help restore confidence between the two nations. Said he, "Communism has done a lot for the Russians, and the United States cannot convince them that our way of life is better by knocking down their way of life."

THE Eisenhower administration is pointing with pride to the scheduled commercial nuclear power that will become available, in 1958, to join the conventional power plants. Cabinet officers at a recent meeting discussed the U.S.'s first big commercial atomic energy plant at Shippingport, Pa.

The plant, with a 60,000-kw capacity, will receive national attention when it goes on the line. The capacity will be large enough to serve a city of 250,000 people. Other plants are being built near Chicago, Detroit, and New York. By 1962 the U. S.

will have over 1,000,000 kw of nuclear power capacity; by 1967, 7,500,000; by 1977, about 133,000,000.

Interior Secretary Fred A. Seaton predicts that within 20 years it should become competitive with conventionally produced power throughout the Nation. However, some members of the Joint Congressional Atomic Energy Committee predict that it will become economically competitive in little more than a decade.

THE Bureau of Public Roads is submitting a re-estimate of the cost of completing the interstate system of highways. The cost of building the big multilaned, divided expressways has increased so much since the Bureau made its last estimate in 1954 that Congress will have to amend the 1956 Highway Act if the program is to be completed in 13 years.

Meantime, Maryland, California, and New York are leading all states in the obligation of 1959 fiscal year Federal aid funds on the interstate, primary, secondary, and urban highways.

Approximately 6000 miles of free and toll roads already are located on the 41,000-mile interstate system because they were built to interstate standards. Congress will be asked at the coming session to free 2100 miles of toll roads which are a part of the 6000 miles of already located super highways.

MOST engineers and scientists who will be needed by 1965 in this country are either in high school or will be entering next fall. Therefore, Under Secretary of Labor Millard Cass admonishes, "If we do not see that these young people take the high school courses necessary for future training in colleges, apprenticeship programs, or industrial courses, we shall have made it impossible for them to qualify for the further training required to attain the skills they and the nation need."

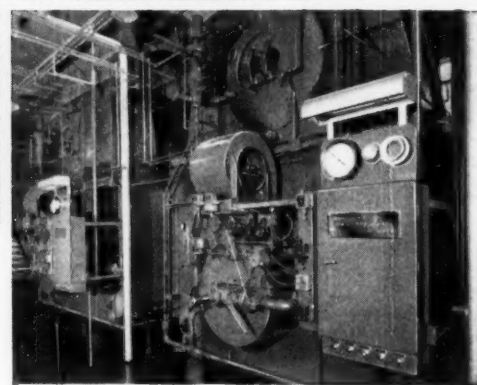
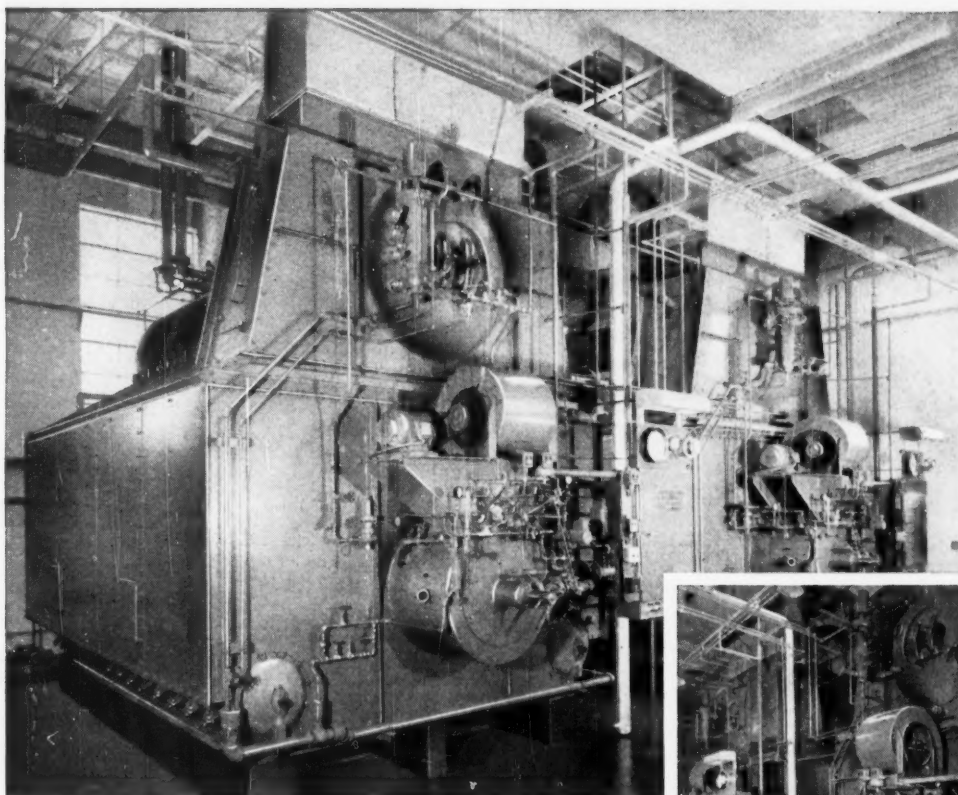
AN appeal has been filed in a recent Washington, D. C. case in which Tax Court Judge J. V. Morgan said a corporation practicing engineering would "subject itself to a criminal penalty." Morgan ruled that "a corporation designed to engage in the practice of professional engineering cannot lawfully be organized under District of Columbia laws."

Since in D. C. the term "unincorporated business" cannot be used by any trade or business which cannot incorporate, this all boiled down to one question — can engineers incorporate or can they not?

Explaining that he is aware of many "engineering" corporations in the District of Columbia, Judge Morgan said: "Moreover, it might be observed that many so-called 'engineering corporations' are no more than construction companies, which euphemistically include the word 'engineering' in the corporate name."

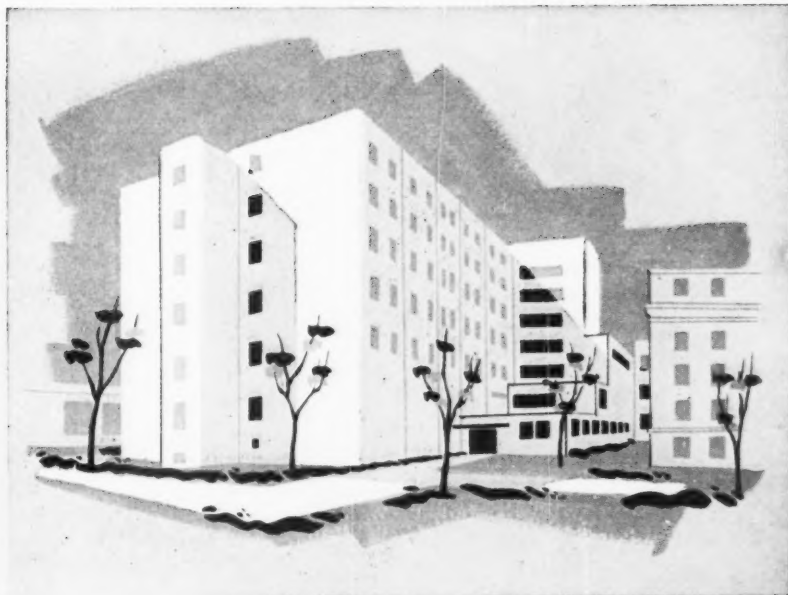
The case now is pending before the United States Court of Appeals. ▲▲

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specified for the Edward W. Sparrow



Wickes Type-A Steam Generators combine custom engineering and shop-assembly to give you economical "packaged power" to exactly meet the load requirement. The entire unit is shipped complete ready to set on your foundation and installation can be made with minimum interruption of your production schedules. All necessary auxiliary equipment including trimmings, soot blowers, feed water regulators and other accessories, are shop-installed leaving field installation at a minimum. From the pressure-tight casing to the oil-gas burner, Wickes type-A water tube steam generators with capacities up to 60,000 lbs. of steam per hour are designed and engineered to be the standard of quality and performance in a variety of industries.

boilers are hospital



Architects sketch of new Sparrow Hospital.

Architects: O. J. Munson Associates—Lansing, Michigan.

Professional Engineers: E. Roger Hewitt Associates, Inc.—Lansing, Michigan.

One of the most important considerations in hospital construction specifications is the steam generation system, because it must give around-the-clock reliability without failure. It is significant, then, that for the Edward W. Sparrow Hospital in Lansing, Michigan, two Wickes shop-assembled Type-A Steam Generators have been installed to provide a dependable source of heat. The new units, which are housed, in a completely new boiler house, replace the original Wickes coal fired boilers. Each of these two new boilers are capable of producing 18,500 lbs. of steam per hour at an operating pressure of 125 psi. They provide 2250 square feet of heating surface and are equipped with fully automatic Wickes combination oil and gas burners. These units have a design pressure of 160 psi.

Write for our Catalog 56-1 for detailed information on Wickes Type-A Boilers, and we will also include our Bulletin 55-1 covering the complete line of Wickes Products and Facilities.



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The Reader's Guide

The Cover

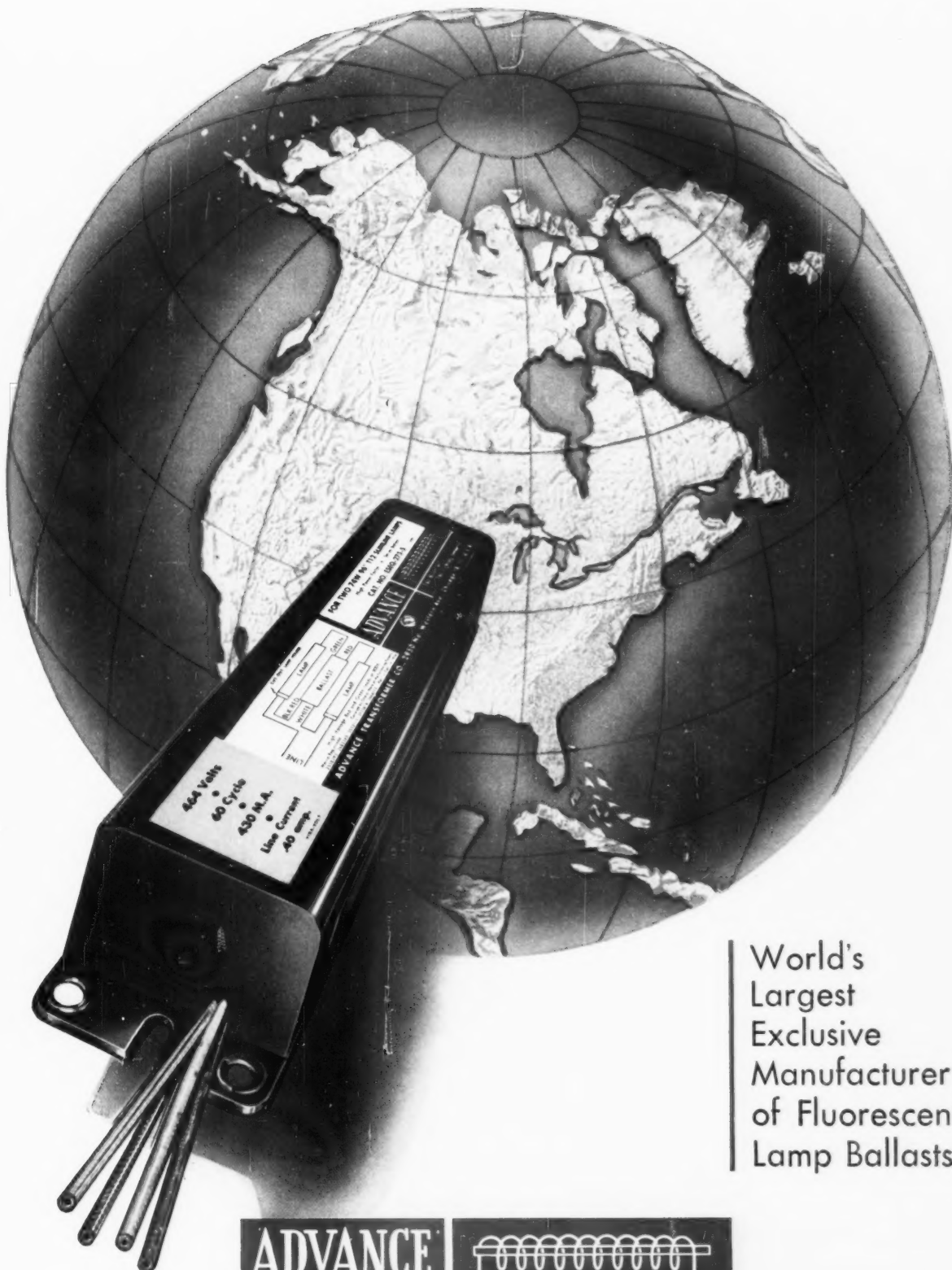
This month, for the first time in five years of publication, there is a new kind of personality on our cover. Here is no consulting engineer but instead a reporter. Perhaps it would be proper to call him a journalist. Clearly he is an humble man, but he is conscientious and hard-working. He is getting to be an old hand around our editorial offices. Philip Reed, our Art Director, created him as a woodcut for a promotional booklet we published three years ago. We found him a pleasant sort, so he next appeared on our letterhead, where many of our readers have met him. Now, he has made the front page, you might say, and takes his place among the many notable engineers who have looked from our cover month after month. We had him registered (as a trademark) just so that he would not feel out of place in the company of consulting engineers. It is likely that you will be seeing a lot of him in the future, and each January we expect to bring him back again as our cover personality — for our Annual Survey of the Profession. Next month we will return to our regular format and feature a prominent engineer—Milo Ketchum, of Denver.

This year's Survey deals with a dilemma. The consulting engineer, according to the Survey results, is a little known personage. The public understands his functions not at all, and the several special client groups understand his function only in a vague sort of way. This would imply that there is a desperate need for an educational campaign to tell the general public and special client groups about the consulting engineer and his work. Yet, engineers in private practice, as professional men, generally agree that personal advertising, certainly display advertising, is distasteful and degrading. The Canon of Ethics condemns "self-laudatory" advertising, though it is a weak ordinance, toothless and impotent. If consulting engineers cannot ethically advertise, does this mean that they must confine their work to their own neighborhoods, where their reputations can be spread by word of mouth? That is what doctors and lawyers do, but it would be an obviously impractical solution for consulting engineers. Some other means must be found. Engineering organizations might undertake a public relations program for engineers in private practice; manufacturers might promote the profession in their advertising (as insurance companies and pharmaceutical houses promote the medical profession in their advertising); and individual firms of engineers might find dignified ways to tell about their services. In this issue, the report based on the Survey tells what the situation is today. It sets the stage so that consulting engineers may realize how little they are known and how serious their need for publicity (See "How Well Are You Recognized?," page 82).

The Survey

Greek Thought

There is much of the philosophy of the ancient Greek in the average American. The Greeks thought that the time to worry was when things were going good. The typical Greek tragedy started off with everyone happier than they ever had been, but just then all Hell broke loose. We tend to think that way, too. Just let economic conditions hit a high and stay there for a while, and we feel sure disaster is bound to be waiting for us in the next fiscal year. Certainly there were enough seers and some signs pointing to a downtrend in the economy in 1958, but so far as consulting engineers are concerned, the Depression will have to be postponed for some while yet. There will be a slight drop in total capital expenditures, but construction in almost every category will go up instead of down. So 1958, for consulting engineers, should be even better than 1957. Our economic forecast (page 78) is prepared this year by William G. Dooly, Jr., who is on the staff of Associated General Contractors and editor of their magazine, *The Constructor*. No Greek he.

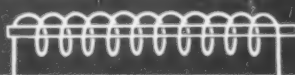


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Greek Power

Speaking of Greeks, Ebasco recently completed a whole new power network for the Kingdom of Greece. This is the first time engineers have had the opportunity to start from scratch and design a nationwide power system without having to tie in with older generating or distribution facilities. Ebasco designed and supervised construction of new hydro and steam stations and even found a large new source of lignite for fuel. New lines now carry current to towns and villages where electricity was all but unknown. Andrew J. Hoffman tells about Ebasco's work on this huge project in "Greece Gets a New Power System," on page 102.

We just finished compiling the comments received as a result of the most recent topic put before our Committee of One-Hundred. This topic deals with catalogs prepared by equipment manufacturers and material suppliers for the use of consulting engineers. The Committee, made up of prominent engineers in private practice from all parts of this country, told us what is wrong with most catalogs now being sent to them and what might be done to improve them. There were also a few good comments on how these catalogs could best be used by the consulting engineer. It seemed rather senseless to use the pages of this magazine, which goes only to consulting engineers, for an article telling manufacturers how to write catalogs, so you will find on page 114 only a brief summary of the Committee Report. It points out the serious need for a standard filing system for engineers' catalogs. The Producers' Council and the Consulting Engineers Council now have a joint committee working on this, and the job is one that should be completed without delay. The full Report of the Committee of One-Hundred is being printed and distributed to manufacturers and their advertising agencies. They are the groups to profit from it. But if you would like a copy, write us.

Usable Catalogs

Electrical and Structural

In this issue there are also two good design articles, on widely differing subjects. Eugene Herzog, a consulting engineer of Dayton, Ohio, has had considerable experience recently in the design of special, medium frequency distribution systems. He tells, in his article, "New Ideas for Medium Frequency Distribution," page 94, of some interesting solutions to special problems that arise when dealing with design work in this distribution range. In an entirely different field, E. M. Khoury, a consulting engineer of Los Angeles, Calif., writes about a new design he has developed for large, multistory parking garages. He makes use of a warped surface in the center of the structure to eliminate the need for elevators or perimeter ramps to get from floor to floor. This warped surface is a hyperbolic paraboloid of gentle slope—a shape that has been popular among structural engineers for several years for thin shell roofs. This idea of using it to replace ramps is something new. The design offers several advantages, as will be recognized when you examine the drawings accompanying the article "Design for a Warped Deck Garage," on page 109.

German consulting engineers have their own organization, *Verein Beratender Ingenieure e.v.*, set up to deal solely with the interests of German engineers in private practice. The association is a member of FIDIC, the International Federation of Consulting Engineers, consisting of ten European associations of consulting engineers. Gault MacGowan and Fred C. Bolton, our correspondents in Germany, have written an excellent report on the German Association and the activities of its members. Germany is now experiencing a general prosperity with plenty of construction work. German engineers, it seems, are participating in it, and they are enjoying the fruits of the freest economy Germany has ever had. The "Report from Germany" starts on page 118. We might learn a thing or two about free enterprise from them. It is most interesting to compare this "Report from Germany" with our "East Coast Report" (page 124) which tells of editorial interviews with officials of GSA and the Defense Department, in Washington.

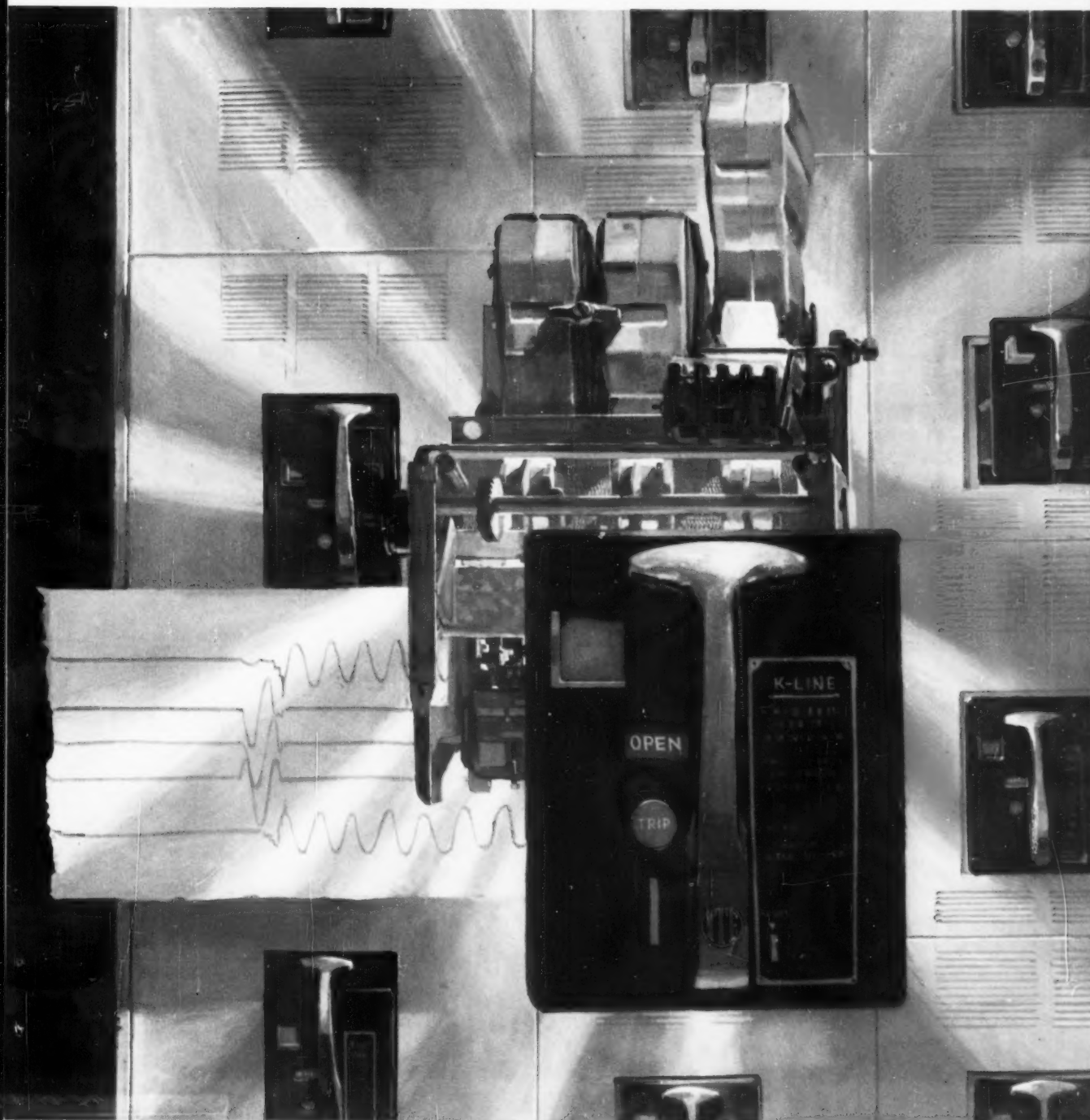
German Consultants

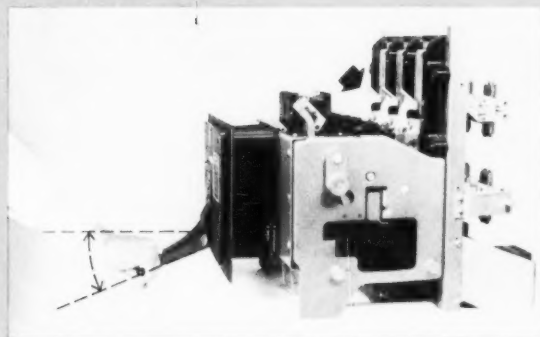
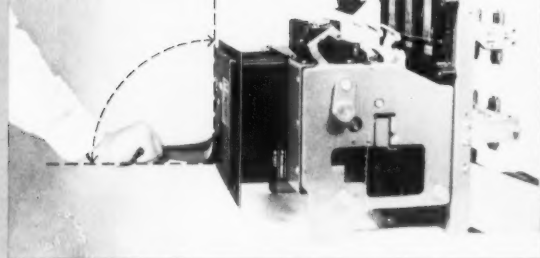
Meetings

Ralph Torgeson's "West Coast Report" deals this month with an interesting meeting of the Structural Engineers Association of California. Most of the talk was about earthquake resistant buildings and new methods of concrete construction. This starts on page 63. You also will find an informative report on the recent annual meeting of the Consulting Engineers Council and some discussion of Founder Society activities in "Heard Around Headquarters," page 39.



I-T-E new K-Line of low voltage switchgear represents the first major advance in this type of equipment in 13 years. This completely new design offers greatly increased safety and operating efficiency, is available in three frame size ratings: 225, 600 and 1600 amp continuous at 600 v alternating current.





Quick-make closure of contacts on manually operated circuit breakers is provided by spring action. The first 90% of the pulldown handle travel loads the springs, the last 10% releases the stored energy and closes the contacts. No teasing is possible.

I-T-E announces sweeping design advances in new line of low voltage power circuit breakers and switchgear

- First quick-make closure of contacts
- First closed-door racking of circuit breakers to any position
- First expanded range overcurrent trip device
- 4-high stacking of 600 amp frame size circuit breakers
- Subassembly construction of circuit breakers & accessories

Quick-make manual closure eliminates damaging arcing, greatly increases life of contacts and circuit breaker—contacts cannot be teased together, breaker cannot be destroyed by careless closing against a major fault.

Quick-make closure, formerly available only on electrically operated circuit breakers, now is a standard feature of all

manually operated breakers in the new I-T-E K-Line.

A manually charged stored energy mechanism, powerful enough to close the contacts safely against a full short circuit, provides the manual quick-make action. The first 90% of travel of the new pulldown handle charges a set of springs, the last 10% of travel releases the stored energy and closes the contacts—breaker life and operator safety do not depend on the brawn and brain of the operator. Contacts cannot be teased together, the closing action is fast and positive.

Electrically operated models in the K-Line have an actuating motor in addition to the basic mechanism. This motor-driven, stored energy system requires only 10 amp from a simple power source, compared to as much as 160 amp by comparable solenoid mechanisms. Energy for closing is prestored by the new K-Line circuit breakers in 2 seconds. Closing time is 5 cycles.

Closed-door drawout keeps circuit breakers clean and aisles uncluttered, promotes operator safety

This exclusive I-T-E feature permits racking of breaker into connected, test and disconnected positions without opening the door of the breaker compartment. It facilitates inspection, testing and maintenance. Blocked circuits are easy to identify. It keeps circuit breakers clean even in dust and dirt-laden atmospheres. It keeps aisles uncluttered and clear of compartment doors. It promotes personnel safety.

A lift shutter, which permits insertion of the racking crank that moves the breaker, can be padlocked in connected, test or disconnected position to guarantee complete safety. This shutter cannot be lifted while the circuit breaker is

closed. Interlocking also prevents closing of the breaker while the shutter is lifted.

The extendible escutcheon slides through the compartment door while a dust seal surrounding the escutcheon is held in place by the door.

In addition to affording closed-door drawout, the new K-Line of switchgear is smaller than any comparable design. The reduced size of the circuit breakers permits 4-high stacking of 600 amp breakers. And unitized construction reduces the switchgear to three basic components—the breaker, the enclosure, and a cradle on which the circuit breaker rolls for drawout.



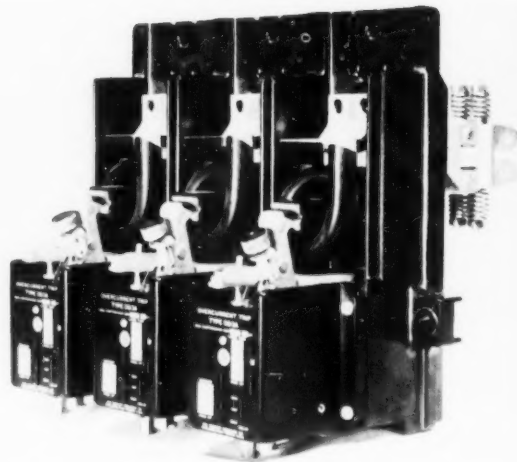
Exclusive closed-door drawout is illustrated in this series of photographs. Photo 1 shows shutter lifted and racking crank inserted. Photo 2 shows circuit breaker in connected position. Photo 3 shows breaker in test position. Photo 4 shows breaker in disconnected position.



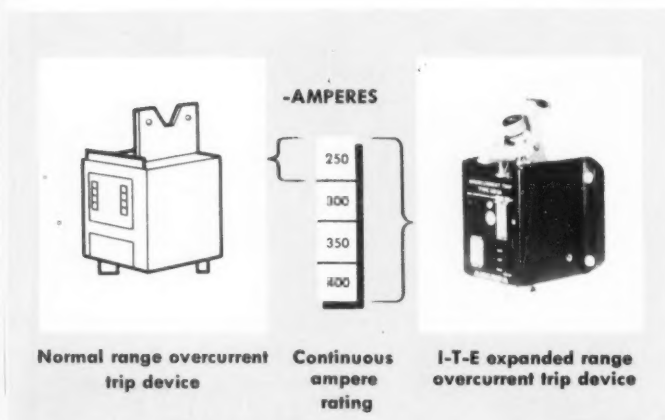
New overcurrent trip arrangement permits use of each trip over wider range of continuous load conditions



Accessible trips, on both manual and electrical types, provide new ease of adjustment. Adjustment, a difficult job at best on previous electrical types, can now be made in a matter of seconds.



Common molding holds all three trips for this 600 amp K-Line circuit breaker. Can be replaced in a fraction of time required for changing the individual trips on comparable lines.



This table indicates a sample grouping of ratings for the new K-Line circuit breakers. Only 9 trip units now cover the range of continuous current ratings as against 23 formerly required.

Trip flexibility is an important feature of the K-Line. Only 9 trip units now cover the complete range of continuous current ratings—15 to 1600 amp—as against 23 formerly required. Last-minute changes in load capacity can be satisfied in many instances with the existing trip unit as a result of the expanded range of trip settings.

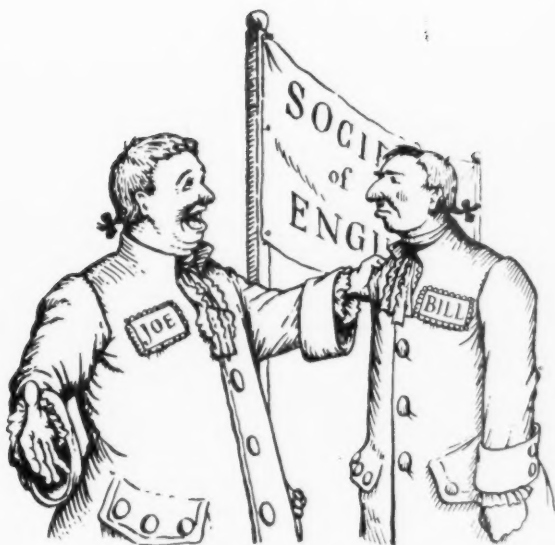
This feature, plus easy adjustment of trip devices and quick change in the field, is particularly significant in meeting constantly expanding load requirements. Trip units are mounted on a one-piece base. Trip units are changed from the rear and in a fraction of the time formerly required.

For the complete story of the I-T-E K-Line of circuit breakers and switchgear, see your local I-T-E representative. Or write us for Bulletin 6004C, I-T-E CIRCUIT BREAKER COMPANY, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa.



I-T-E CIRCUIT BREAKER COMPANY

19TH AND HAMILTON STREETS, PHILADELPHIA 30, PENNSYLVANIA



Heard Around Headquarters

STAFF

Final plans for the new Engineering Headquarters, in New York's United Nations Plaza, are for a 20-story tower building. Demolition of structures now on the site is scheduled to begin next summer, with occupancy of the new building scheduled for autumn, 1960.

With 250,000 square feet of floor space, the new headquarters will include an Engineering Hall of Fame. All centralized services, including the library, the Engineering Index, meeting rooms, check rooms, and possibly a combined shipping room, will be located on the first two floors. Any future expansion of the \$10-million structure will be horizontal.

In addition to the five founder societies, the new building will house: the American Institute of Industrial Engineers Inc., American Rocket Society Inc., American Institute of Consulting Engineers, American Society of Refrigerating Engineers, American Water Works Association, Society of Naval Architects and Marine Engineers, Illuminating Engineering Society, American Society of Heating and Air-Conditioning Engineers Inc., the Electrochemical Society Inc., American Welding Society, and Society of Motion Picture and Television Engineers.

The Consulting Engineers Council held its semi-annual Board of Directors meeting at the Abraham Lincoln Hotel, Springfield, Ill., November 15-16. Again, the group maintained its phenomenal attendance record with directors present from every Member Association. The Board met for almost 15 hours during the two days, handling 30 major items of agenda and hearing 50 reports from committees and member associations.

The admission of the Iowa Association of Consulting Engineers to membership in the Council highlighted the meeting. Iowa brings the total number of state or regional associations now in the Council to 19. The Iowa Association itself has 28

principal members representing 26 consulting firms.

The Council also accepted as a Founder Member the New York State Association of Consulting Engineers. This is not actually a new organization but rather an enlargement and change of name of the Association of Consulting Engineers of Upstate New York, one of the Council's Founder Members.

A number of major revisions in the Council's Constitution and Bylaws were proposed. Most of these are needed because of the current plans to incorporate the Council as a "nonprofit scientific and educational" organization. Other changes were made to make it possible to join EJC in the future.

A report was presented outlining the current situation with reference to Errors and Omissions In-



RENDERING OF THE NEW ENGINEERING HEADQUARTERS.

insurance for members of the Council's Member Associations. The entrance of the Continental Casualty Company into this field of insurance upset the Council's arrangements with Lloyds because many states have laws that, in effect, prohibit the sale of insurance by a foreign company when that type of insurance is available from an American firm. As a result, the Hauth Company, through which the Council was

dealing on the Lloyds policy, found an American company, Fidelity and Casualty, which agreed to offer the Council a policy much like that formerly offered by Lloyds. This situation created a considerable amount of competition in insurance circles, and as might be expected, premium rates are dropping. A representative of the Hauth Co. stated the E & O policies now carry premium rates about 60 percent of those in effect

two years ago. So while the insurance situation has been confused, the policy holder, no matter what company he deals with, has gained.

The Council accepted the offer of the Hauth Co. to handle Fidelity and Casualty policies for members of the Council's Member Associations.

This meeting of the Council differed from its earlier meetings in that the Council has passed through its organizational phase and is now clearly a working group. There were not as many highly charged arguments on policy as at earlier meetings — most of these have been resolved — and the atmosphere was easier. The Council no longer worries so much about what it should do as about getting the agreed upon work done.

The Board showed considerable interest in possible future membership in FIDIC (International Federation of Consulting Engineers). President Wolff reported that FIDIC will hold its annual Board of Directors meeting, in Oslo, the end of May. It is quite likely that the International Federation will discuss the admission of the Council to membership at that meeting. Wolff recommended that the Council have a representative at FIDIC's Oslo meeting as an observer.

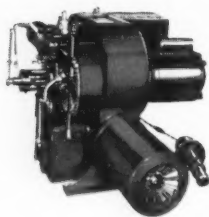
An estimated 7000 members of ASME filled two of New York's largest hotels last month to discuss such things as unity, competitive bidding, education, and a host of technical subjects.

At the luncheon on opening day, retiring president William F. Ryan told members that "you can't feel any terror for the future of this country if you know the caliber of the engineering students coming along to take their places in industry."

He termed engineering students "magnificent," but said the entire profession is suffering from a blind spot. From student days on, the engineers should become more

**Believe us! We know why Cadillac
once published an advertisement titled,**

"The penalty of Leadership"



**No leader can escape the attention
of imitators! There's proof of this
rule in Cleaver-Brooks' HEV-E-OIL —
today's most-copied heavy oil burner**

As stated in the Cadillac advertisement years ago, "In every field of human endeavor, he that is first must perpetually live in the white light of publicity. Whether the leadership be vested in a man or in a manufactured product, emulation and envy are ever at work."

When introduced eighteen years ago, the Hev-E-Oil burner was a standout and constant improvements have kept it so. It still is the first and only burner successfully applying the principle of low pressure air atomization of heavy fuel oils *inside the burner nozzle*. At last . . . a burner that could properly use low-cost, high-heat-content heavy fuel oils, such as No. 5.

Hev-E-Oil features are imitated, of course . . . not in their entirety but in adaptations and "pick-ups" . . .

competition scrambles to find "something just as good."

"If the leader truly leads, he remains . . . the leader."

Consider these Hev-E-Oil exclusives:

- oil atomized inside the burner nozzle by low pressure air,
- all air for combustion furnished by the burner without draft,
- starting delayed until oil temperature is correct for electric ignition,
- automatic pressure lubrication with lubricating oil,
- the only line of combination oil and gas burners burning either fuel at maximum efficiency.

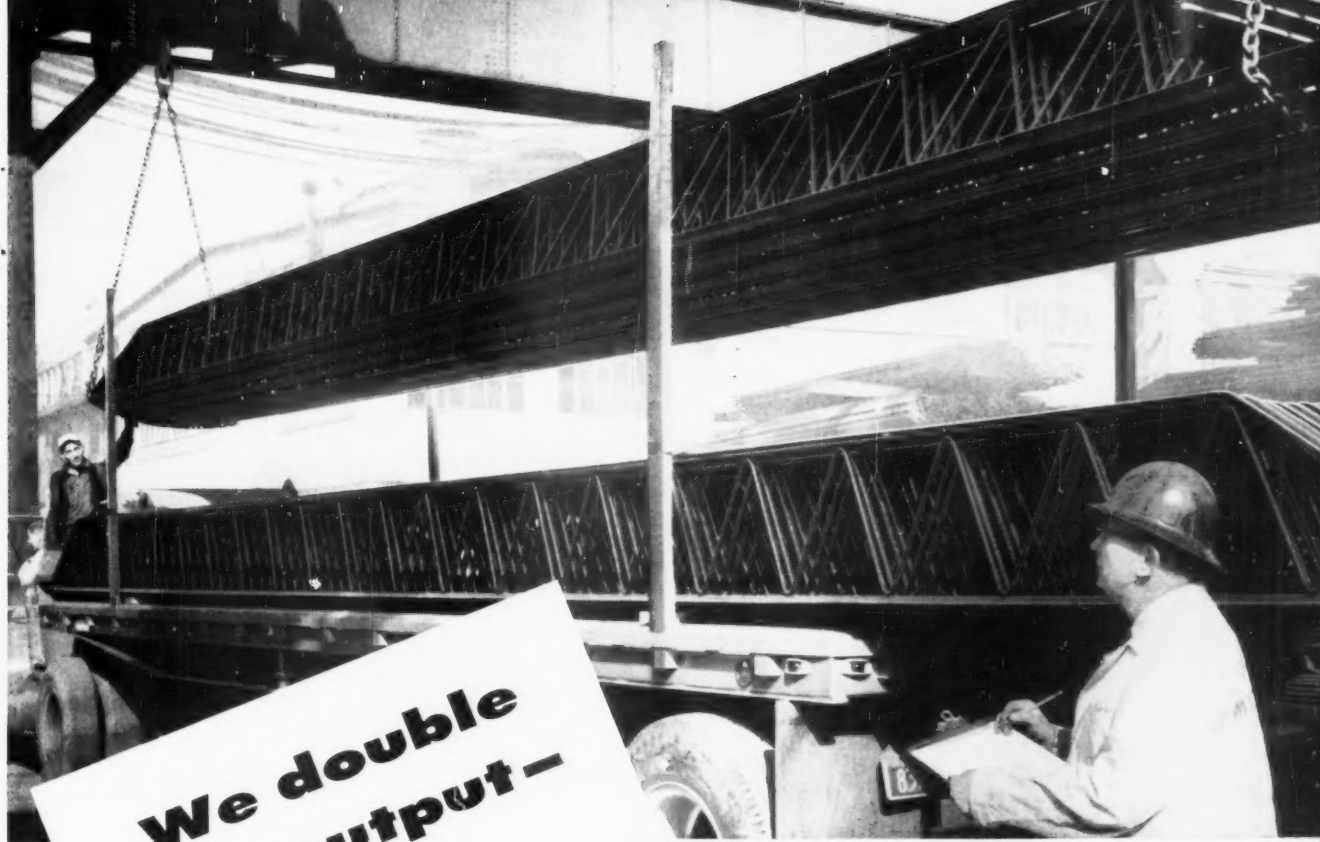
These are the Hev-E-Oil burner features that make it so modern it'll be new and unequalled for years to come.

Write today for complete information.

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380 East Keefe Avenue, Milwaukee 12, Wisconsin**

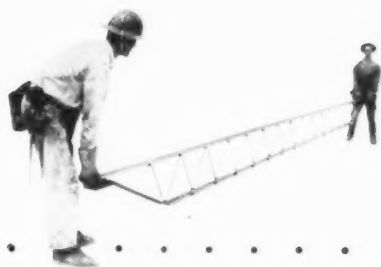
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With a new and completely modern production line now in operation at Gary, Indiana, we are turning out twice as many AmBridge Standard Steel Joists. This means that we can give you immediate delivery . . . and that your order will be shipped from

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When you need joists, just call our nearest contracting office. You'll not only get the finest joists available anywhere, *but you'll also get the fastest service.*

USS AmBridge Steel Joists provide lightweight and economical construction suitable for any type of floor, roof and ceiling. The underslung and open-web design provides for maximum headroom and allows passage of pipes, ducts and

conduits in any direction. Their light weight, combined with the simplicity of end connections and accessories, reduces man-hours of erection time. No special equipment or false-work is needed.

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AMBRIDGE STEEL JOISTS



UNITED STATES STEEL

aware of their full professional responsibilities.

Urging that more colleges stress the importance of registration, Dr. Ryan said, "I think it's cruel to send a boy out into the engineering profession today without his understanding what registration can mean to him in the future."

Dr. Ryan also had a few words to say about the members who pay their dues and then never show up at any meetings . . . "God

bless them if they pay their dues. It helps us all."

An important development of the convention came at the Council meeting, when it was voted to endorse the AIEE unity proposal "in principle."

Dr. Ryan said he still feels that NSPE should join EJC — as an important move toward unity.

At the ASME Annual Meeting, in a speech before the consulting engineers group, Edward H. An-

son, then president of the American Institute of Consulting Engineers, said that with proper sponsorship a grievance committee could abolish competitive bidding and other unethical practices.

"Here we are, in 1957, 43 years after this problem (competitive bidding) was first recognized by ASCE, and we still are trying — I repeat — trying, to solve it."

Anson said he reads where one professional society believes competitive bidding still is disturbing, but reports few incidents have been brought to the organization's attention this year.

"I believe this record of fewer incidents is due solely to the trouble in the present method of enforcement," Anson added.

If an organization like ECPD, FJC, or a joint group representing the profession would sponsor and support a grievance committee similar to that operated by the Bar Association, Anson said he believes "the bugaboo of unethical practice would evaporate."

Three new members have been appointed to the professional practice of consulting engineering committee of ASME. The new members are: John K. M. Pryke, Consulting Engineers Council Past President, New York City; Frederic E. Lyford, executive director, Committee on Engineering Laws, New York City; and Henry A. Naylor Jr., Baltimore, Md. Re-appointed to the committee was Harold V. Coes, of Montclair, N. J.

Now you can refer correctly to the "five founder societies." The American Institute of Chemical Engineers, which has been counted unofficially among the founder societies for some time, now has made the proper financial arrangements with United Engineering Trustees, has received the blessing of the other four founder societies, and is officially among the engineering society elite.

The price, arrived at after much discussion, was \$50,000 for the

**Your client gets
twice his money's worth...**

**DAY-TO-DAY VENTILATION
plus FIRE PROTECTION!**

**WITH COLT
DUAL PURPOSE FIRE VENTILATORS**

Unlike most fire protection equipment which serves no useful purpose until an unwanted emergency arises, Colt's new Dual Purpose Fire Ventilators **work every day** in your client's plant. In addition to functioning as a needed and efficient system of natural ventilation, the Colt COF/2046 Ventilators open automatically in case of fire to serve as a heat and smoke exhaust.

Fire authorities throughout the country agree that superheated air, smoke and explosive gases trapped under a roof with no ventilators or natural openings are the main cause of the horizontal spreading of disastrous industrial fires.

When you specify Colt Dual Purpose Ventilators in your client's building you give him twice as much . . . ventilation and fire protection . . . at no more cost than an ordinary ventilator.



In day-to-day use, the Colt COF/2046 Dual Purpose Fire Ventilator provides efficient, natural ventilation. In the event of fire, a fusible link triggers the ventilator open, providing automatic escape for superheated air and smoke.



Write today for free copy of "A Lecture on Fire Control in Industry" by M. J. Reaney.

ALSO: Free Technical Manual giving full details of the Colt System and equipment used.

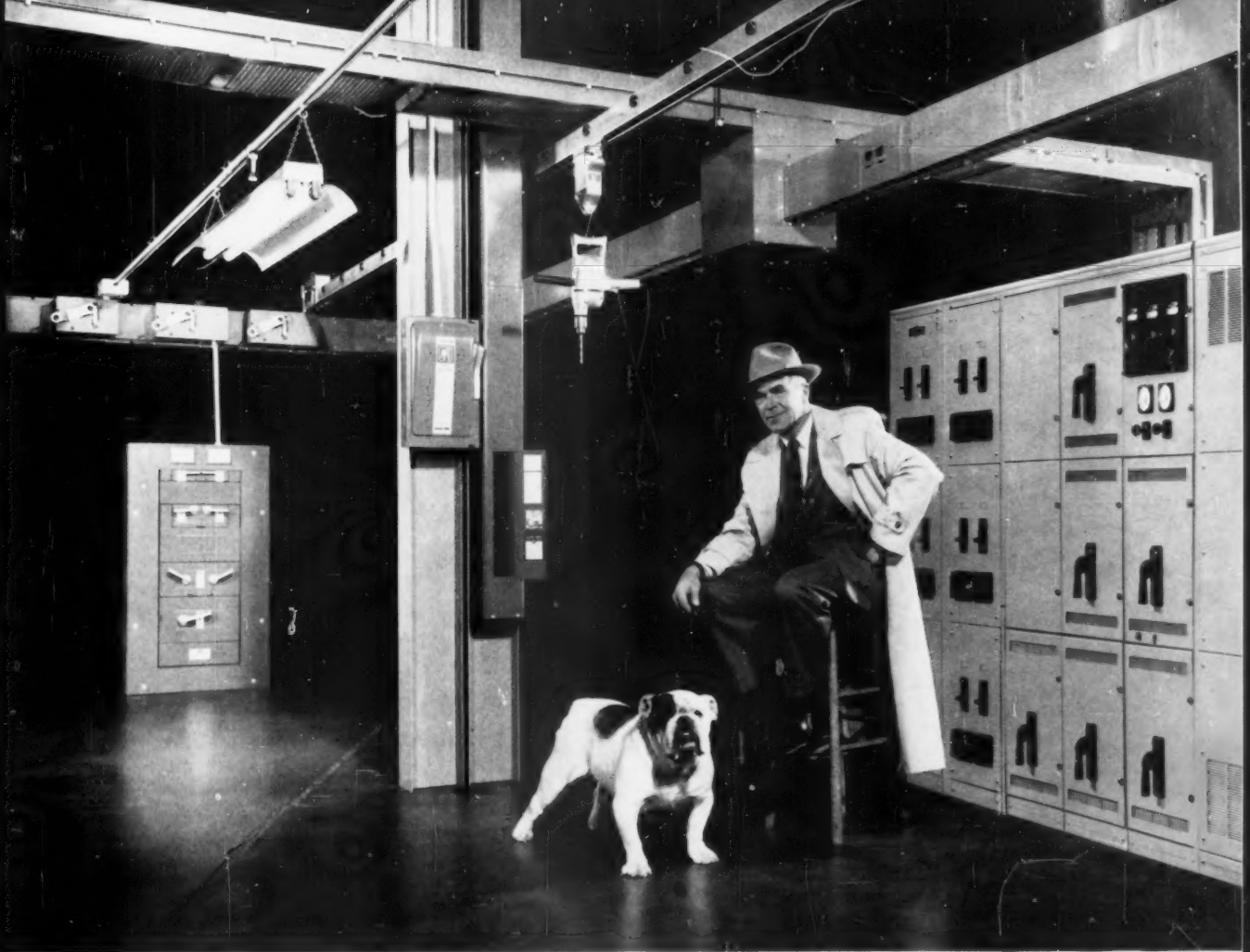
ANOTHER FINE PRODUCT BY

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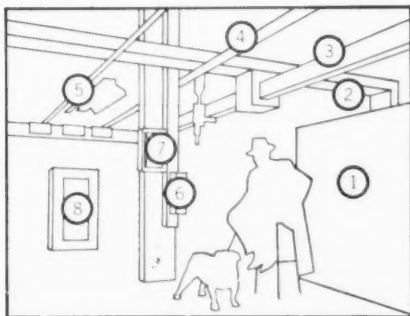
4652 Hollywood Boulevard, Los Angeles 27, California • NOrmandy 1-0261



Shown above are some of the 27 CO/2046 Colt Clear Opening Adjustable Louver Ventilators installed in the saw-tooth roof at Nardon Manufacturing Company in Alhambra, California.



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When selecting unions it will pay you to remember 2 things: (1) Darts can be used over and over again — on location after location (2) On location after location, they give a drop-tight seal. How can you beat this combination for economy . . . at any price?

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chemicals to become a founder society. The other four Founders equity in UET is much larger.

The Chemicals also have agreed to contribute to the support of the Engineering Library — but only after the new headquarters building is finished. Then, being in the same building, AIChE will have equal access to the facilities.

The editor of *Who's Who In Engineering* is having his troubles these days.

E. N. Dodge, editor, said that every six months, about 40 percent of the engineers listed in *Who's Who* change their addresses. And he has to check them all for the next edition.

With a sigh, he pulled out some of his mailing records. On a typical day, about 11 out of 34 pieces of mail sent out by *Who's Who In Engineering* are returned because of address changes.

In the old days, the postman would walk a few steps down the street to deliver a letter if the address was slightly wrong. Now, Dodge said a letter is not delivered if an office has several numbers and you do not happen to address the letter to the number on the mail slot.

So even if you were listed in the last edition of *Who's Who In Engineering*, drop Dodge a note if you have moved.

Representatives of 20 consulting engineering firms have formed the Consulting Engineers Council of Metropolitan Washington and have retained an attorney to incorporate the group as a non-profit organization.

Second meeting of the organization will be on Jan. 21 at 8 p.m., in the National Housing Center, Washington. At that time, an attorney will report on the proposed constitution and bylaws.

Kenneth W. Cobb, of Kluckhuhn, Cobb & McDavid, temporary chairman, explained that in the District of Columbia "we long have needed an organization by and for the consulting engineer.

CONSULTING ENGINEER

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	Trichloromonofluoromethane	Dichlorodifluoromethane	Monochlorodifluoromethane	Trichlorotrifluoroethane	Dichlorotetrafluoroethane
	genetron 11 ORANGE LABEL	genetron 12 WHITE LABEL	genetron 22 GREEN LABEL	genetron 113 PURPLE LABEL	genetron 114A DARK BLUE LABEL
Chemical Formula	CCl ₃ F	CCl ₂ F ₂	CHClF ₂	C ₂ Cl ₃ F ₃	C ₂ Cl ₂ F ₄
Molecular Weight	137.4	120.9	86.5	187.4	170.9
Boiling Pt. (°F) at 1 Atm. Pressure	74.7	-21.6	-41.4	117.6	37.6
Evaporator Pressure at 5° F (p.s.i.g.)	24.0*	11.8	28.3	27.9*	15.6*
Condensing Pressure at 86° F (p.s.i.g.)	3.6	93.3	159.8	13.9*	22.7
Freezing Point (°F) at 1 Atm. Pressure	-168	-252	-256	-31	-76
Critical Temperature (°F)	388	234	205	417	294
Critical Pressure (p.s.i. absolute)	635	597	716	495	478
Compressor Discharge Temperature (°F)	112	101	131	86	88
Compression Ratio (86° F/5° F)	6.24	4.08	4.06	8.02	5.33
Specific Volume of Saturated Vapor at 5° F (cu. ft./lb.)	12.27	1.46	1.25	27.04	4.04
Latent Heat of Vaporization at 5° F (B.t.u./lb.)	84.0	68.2	93.6	70.6	60.2
Net Refrig. Effect of Liquid—86° F/5° F (B.t.u./lb.)	67.5	50.0	69.3	53.7	43.0
Specific Heat of Liquid at 86° F (B.t.u./lb.°F)	0.21	0.24	0.34	0.22	0.23
Specific Heat of Vapor at Constant Pressure of 1 Atm. & 86° F (B.t.u./lb.°F)	0.13	0.15	0.15	0.15	0.16
Specific Heat Ratio at 86° F & 1 Atm. (k=Cp/Cv)	1.14	1.14	1.18	1.09	1.01
Coefficient of Performance	5.09	4.70	4.66	4.92	4.60
Horsepower/Ton Refrigeration	0.927	1.002	1.011	0.960	1.025
Refrigerant Circulated/Ton Refrig. (lbs./min.)	2.96	4.00	2.89	3.73	4.65
Liquid Circulated/Ton Refrig. (cu. in./min.)	56.0	85.6	68.0	66.5	88.7
Compressor Displacement/Ton Refrig. (c.f.m.)	36.32	5.83	3.60	100.76	18.78
Toxicity (Underwriters' Laboratories Group No.)	5A	6	5A	4-5	6
Flammability & Explosivity	None	None	None	None	None

*Inches of mercury vacuum.

COMPARE! Careful control at every step in the manufacture of "Genetron" Super-Dry Refrigerants results in products of highest purity, which are extremely low in moisture content and other undesirable impurities. Quality of current production consistently surpasses the rigid manufacturing specifications for these products. Write for important informative folder "Genetron Super-Dry Refrigerants."

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- Reserve Capacity Always Available
- Fully Coordinated—fire tested
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erators • ASME Code Pressure
Vessels & Welded Products.

Like every other field of endeavor, consulting engineering has its problems which are unique. A forum where these matters can be discussed, we feel, is found in such an organization."

The proposed constitution would limit membership to sole proprietors, partnerships, or corporations primarily engaged in the practice of consulting engineering for the construction industry as a professional service.

Excluded would be engineers who are subsidiary to government, industrial, utility, or architectural offices.

A proposal that firms in which architects are part owners should not be eligible for membership will be discussed in January.

Walter J. Barrett, president of the American Institute of Electrical Engineers, reports that the "San Francisco Plan" (commonly referred to as the AIEE plan for unity) often is misunderstood.

A recent AIEE letter to section chairmen stressed that "the Board of Directors has reviewed the policy and voted that the action of the board at San Francisco did not propose that AIEE relinquish any of its interests and activities."

Barrett said this statement is aimed at clearing up the misunderstandings, and is not an indication that AIEE is backing down or in any way modifying its original proposal.

One of the primary misconceptions regarding the San Francisco plan was that it involved NSPE letting nonregistered engineers into its ranks.

Barrett said this is not accurate. AIEE merely proposed what it thought would be an ideal for the three groups (EJC concentrating on technical activities, ECPD on education, and NSPE on professional activities).

At San Francisco, the AIEE board, in a separate action, merely suggested that NSPE open its ranks for a period. Later, AIEE went a step further, and stated that if NSPE would open up its

CONSULTING ENGINEER

FOR CONTROLLING PUMP DISCHARGE OF STEAM-DRIVEN PUMPS...

... Foster Pump Governors are all self-contained, and do not require outside media for control, such as air or electrical service for operation.

All are pilot valve controlled, with piston actuated main valves. The diaphragm type pilot valves are very sensitive and respond to small pressure changes, which assures close regulation and control of the pump discharge pressure.

There is a Foster governor for every type of service with materials and end connections to suit all pressures and temperatures:

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Constant Pressure Constant pressure fire and house pumps, fuel and lube oil pumps, and hydraulic elevator pumps	P6
Excess Pressure Boiler feed pumps, turbine-driven centrifugal or reciprocating	P7
Vacuum Pumps for condensers, autoclaves, processing evaporators, and vacuum type heating systems	P13
Steam-Oil Atomizing For control of oil fired units using steam as atomizing medium	P14

Foster governors and relief valves are also available for controlling discharge of motor-driven pumps.

BULLETIN P-101

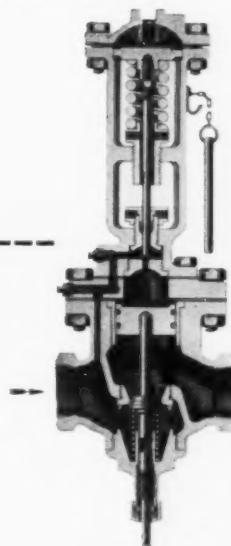


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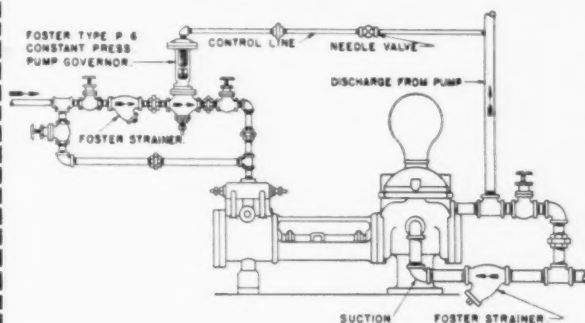
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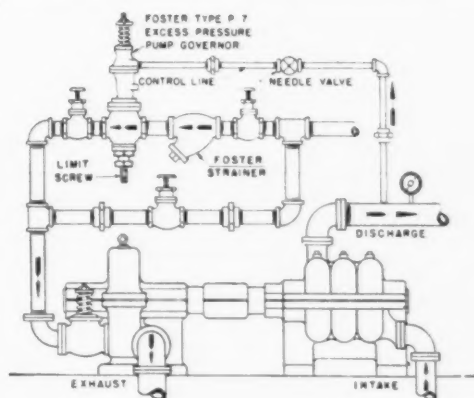
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Foster Type P6



Typical Constant Pressure System

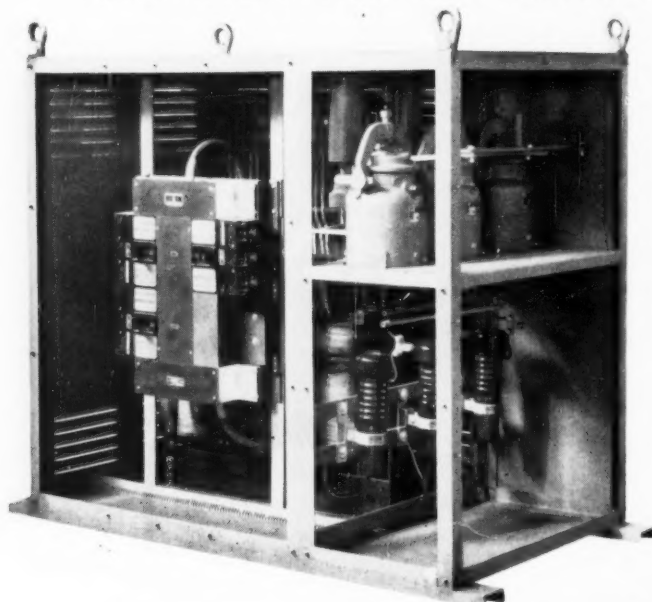


Typical Excess Pressure System

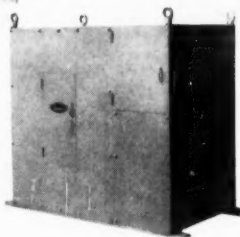


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ranks, AIEE would urge all its members to join NSPE.

"We recognize there are a lot of old-timers who have jobs which do not require them to be registered. They would be reluctant to take licensing examinations."

Barrett added that AIEE has suggested to NSPE that it allow nonregistered persons to join for a limited time. Soon, the nonregistered men would be retiring, and young graduates, who became registered as soon as they were eligible, would make up the memberships of both NSPE and the technical societies.

The AIEE president also suggested that while NSPE is allowing nonregistered persons to join, a special grade of membership could be established for them.

Barrett also explained that the San Francisco plan would do nothing to eliminate "splinter groups." There would be as many engineering organizations under the plan as there are at present.

Explaining the relationships of the technical societies to the three groups, Barrett said that — for instance — ECPD would be concerned with education under the AIEE proposal. Such groups as AIEE would decide what they think constitutes professional education, and their recommendations would be carried out by ECPD.

"Now we have duplication of efforts. ECPD is concerned with education, and EJC is concerned with education. It's like my lawyer worrying about my health, while my doctor worries about my legal affairs," Barrett added.

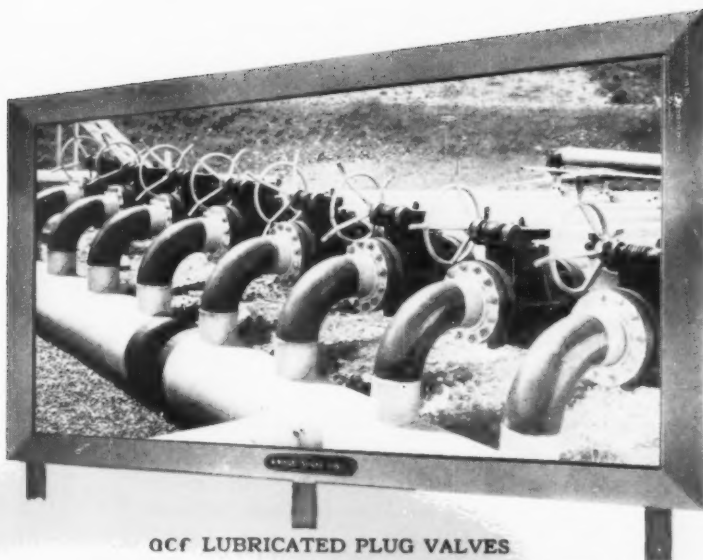
Under the AIEE plan, one over-all engineering society "might or might not" eventually emerge.

"I believe, and my board agrees, that there should be one over-all electrical institute. We would like to have the Institute of Radio Engineers, the Illuminating Engineers, and others, merge with us. But we don't expect to see this come about in the near future," Barrett added.

In view of the San Francisco plan, what position does AIEE

CONSULTING ENGINEER

signs of *CLIENT* *SATISFACTION*

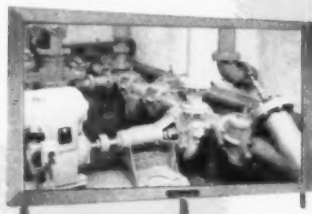


OCF LUBRICATED PLUG VALVES
on suction and discharge line in natural gas compressor station.

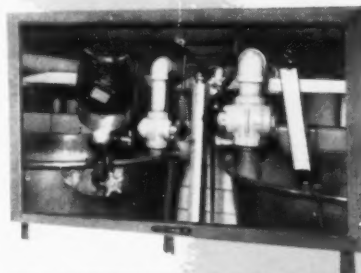
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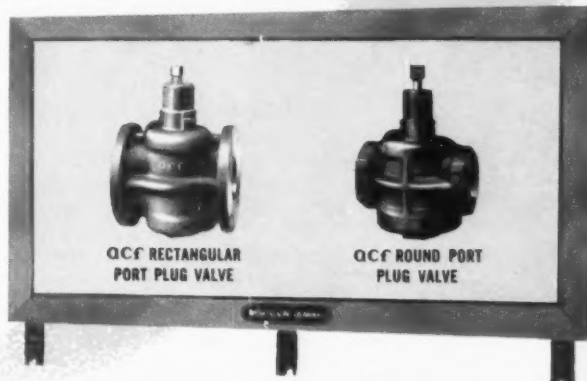
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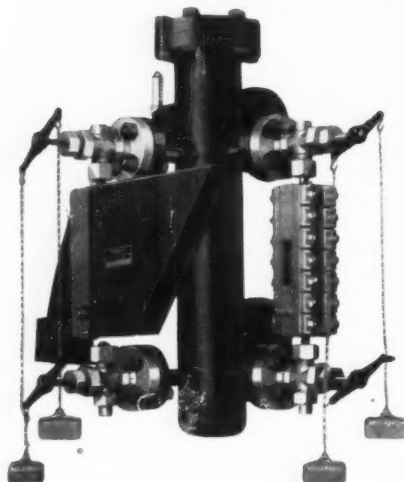
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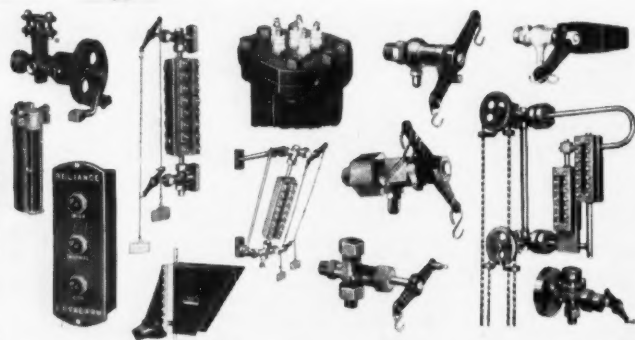
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BOILER SAFETY DEVICES

take in voting on current EJC proposals?

"We're making our position as plain as we can. The San Francisco plan is what we feel should be—but it isn't yet. We have to face the facts."

The National Society of Professional Engineers board has adopted a policy statement telling when the term "engineering" can be applied to a job description.

To qualify for an engineering title, the person should be either registered under a state engineering registration law, a graduate of an accredited engineering curriculum, or covered by an official ruling under the Taft-Hartley or Fair Labor Standards Act.

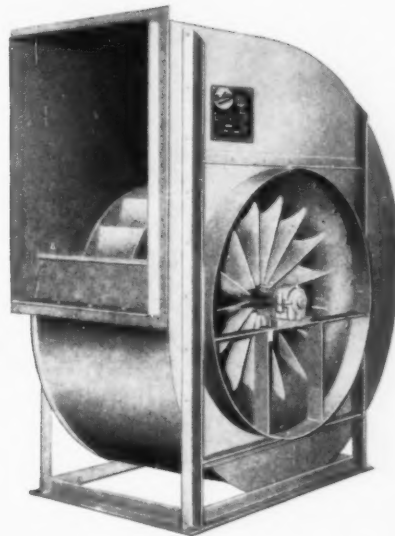
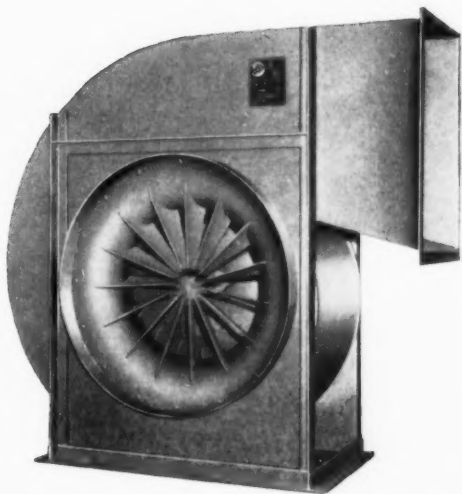
At a meeting in Chicago this month, ASCE will work with representatives of the Bureau of Public Roads and a number of state highway departments to prepare a fee schedule for consulting work on highway projects.

At the recent ASCE convention in New York City, Tallamy, head of BPR, requested (see CONSULTING ENGINEER, December) that new fee curves be established for the use of highway agencies at all government levels.

The revised schedule, which is intended to be merely a yardstick by which fees can be measured, will be included in the new edition of ASCE's Manual 29 (on consulting practices).

An American Road Builders Association engineering committee, which had been studying consultants' fees before Tallamy made his request, has worked with the ASCE committee in an advisory capacity. Although members of Consulting Engineers Council or the American Institute of Consulting Engineers have not been invited to assist with the fee preparations, a number of consulting engineers have been working with the ASCE group.

Louis R. Howson, ASCE president, had been chairman of a committee working on a revision of



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so should the fans!

To enable you to more correctly meet varying pressure requirements, Buffalo Forge offers not just one fan design for high and low pressure but two specially

FOR HIGH PRESSURES: "BUFFALO" TYPE "BLH"

The "Buffalo" Type "BLH" Fan was recently designed specifically to meet Class III & IV conditions. This insures you of optimum performance on high pressure systems. The high mechanical efficiency of the "BLH" — 86% — is maintained over a broad operating range. Stability of performance is constant from free delivery to shutoff. The unique design of the "BLH" — smooth inlet bell, directional inlet vanes, backward curved blades, divergent outlet — results in unusually quiet operation. All sources of turbulence are minimized.

Investigate the "BLH" for your high pressure requirements. Consult your nearest "Buffalo" Engineering Representative, or write today for Bulletin F-200.

designed fans. The type "BL" is for low and moderate pressure, the Type "BLH" for high pressure service. Here are the details.

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The "Buffalo" Type "BL" Fan has won a solid reputation for efficient performance in many of the largest Class I & II installations. Non-overloading like the "BLH", the "BL" is noted for quiet, stable output from free delivery to shutoff. Unusual design features of the "BL" are responsible for its high operational efficiency. For example, minimum turbulence is assured by the smoothly curved inlet bell with directional guide vanes. Other "BL" features include the rigid wheel, tested and balanced at the factory and the correctly shaped scroll of the "wheel-suited" housing.

For peak performance on your moderate pressure systems, ask your "Buffalo" Representative about the "BL" — or write us for Bulletin F-102.

Every "Buffalo" Fan features the famous "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.

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An entirely new Verti-Line concept for vertical industrial pumps. The discharge head is "Split-to-Pull" making possible many advantages never before available with this type of pump. Here are just a few:

May be flanged in line like a valve.

Remove pump without disturbing piping.

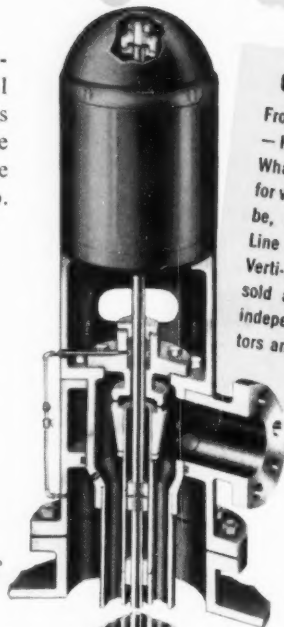
Pump case can be left in line, covered with blind flange.

Minimum NPSH requirements.

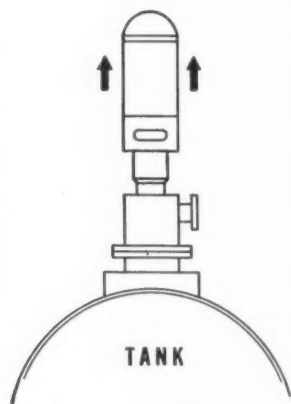
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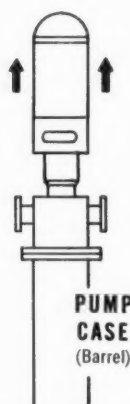
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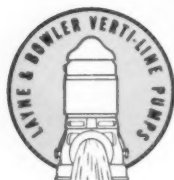
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From 20 to 3000 GPM
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ASCE's manual (which includes the society's fee curves) prior to Tallamy's request. After being elected president, he continued as chairman of the committee.

ASCE spokesmen said Tallamy's request was predicated on the idea that an official fee schedule would eliminate competitive bidding by government agencies.

The recommended fee schedule will be presented to ASCE at a Chicago convention in February.

Connecticut General Insurance

Company has been authorized to sell major medical and life insurance to members of the New York Association of Consulting Engineers.

The group policy, which was approved in principle by the Association's executive committee, will become effective when 75 percent of the member firms elect to participate. The plan will be administered by the Association office.

The plan would pay a maximum of \$5000 during one year. The insured first computes his expenses which exceed Blue Cross-Blue Shield coverage and pays an out-of-pocket deductible of \$100 when making a claim. This deductible applies only once a year, regardless of the number of accidents or sicknesses the individual or his family members may have. The insurance company then pays 80 percent of the balance of expenses, up to \$5000 maximum.

Expenses covered include charges for physicians or surgeons, trained nurses, medical and surgical supplies, ambulance service, and hospital "bed and board."

Official observance of the American Institute of Chemical Engineers Golden Jubilee celebration will begin with the dedication of a plaque in the Engineers Club on Jan. 29. The plaque, presented by George Holbrook, AIChE president, will be "in commemoration of the founding of the American Institute of Chemical Engineers Club of Philadelphia on June 22, 1908."

Here's Why . . .

You Save With Silicone Insulated Outdoor Motors for Power Stations

Silicone insulation is establishing a trend toward less costly enclosures for auxiliary drive motors in power stations. By readily withstanding moisture and contaminants circulated in ambient air, Dow Corning silicone insulation makes possible more open enclosures and lower cost per horsepower.

Leading electrical equipment manufacturers already offer complete lines of silicone insulated "all-weather" motors in ratings from 100 to 5000 horsepower.

Safe, reliable operation outdoors the year 'round is assured by Dow Corning silicone insulation. Experience has shown silicone insulated motors readily withstand torrential rains, hurricane winds, corrosive fumes, fly ash, dust, salt air, snow, sleet, cold, heat — even flooding.

Extra overload capacity is provided by the silicone insulated windings. As a general rule, silicone insulation offers a 50% greater service factor and lasts at least 10 times longer than Class B insulation under similar operating conditions. That's why for the most dependable auxiliary drive motors, it's wise to

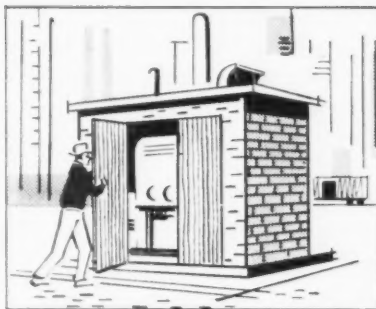
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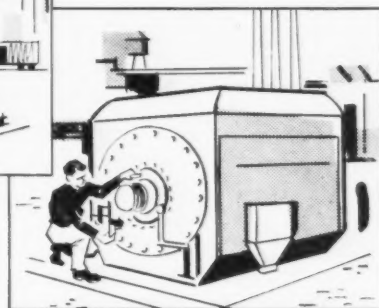
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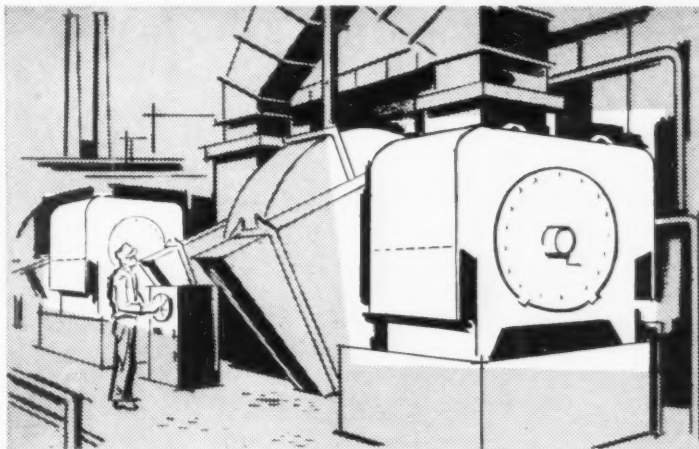
ATLANTA BOSTON CHICAGO CLEVELAND DALLAS DETROIT LOS ANGELES NEW YORK WASHINGTON, D. C.



Initially, motors were sheltered in buildings . . .

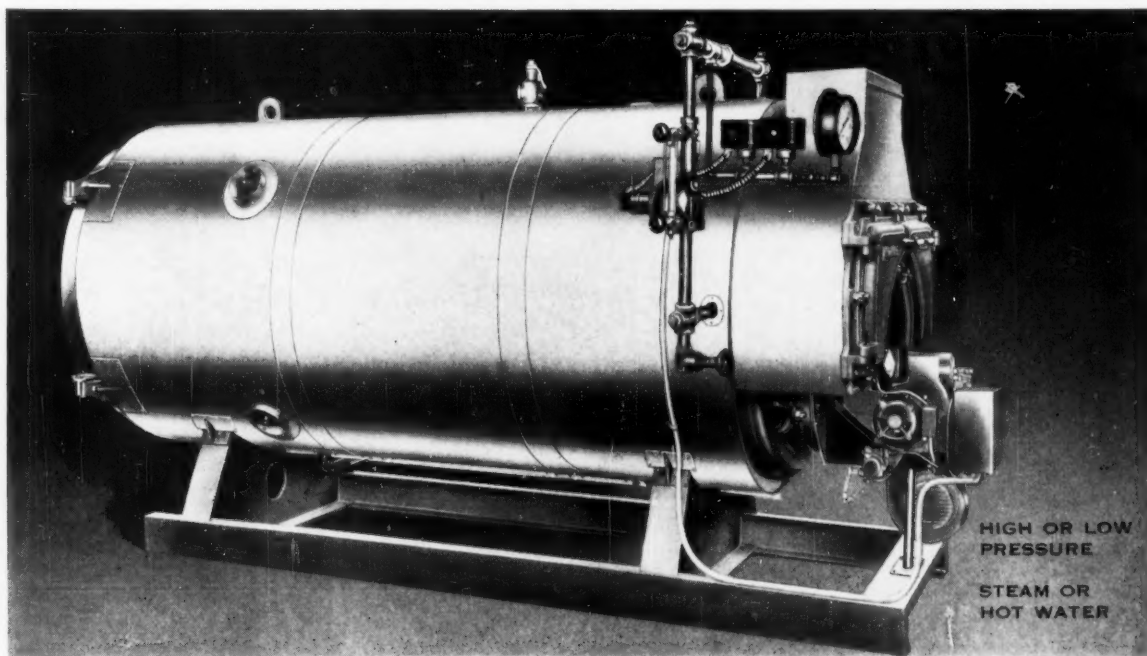


Later, motor enclosures themselves sealed out surrounding atmosphere



Now, silicones protect motor parts permitting the circulation of ambient air . . . lower-cost enclosures.

Announcing 8 new KEWANEE



Kewanee low pressure boiler with Iron Fireman MicroMist forced draft burner for heavy oil.

All advantages of forced draft firing now available in smaller size series

READ THESE SPECIFICATIONS. SIZE RANGE: 18 to 92 bhp. FUELS: Light or heavy oils, gas, or combination oil-gas. **FACTORY ASSEMBLY:** All models available factory assembled as complete package units, ready for service connections on job.

In the new Kewanee-Iron Fireman series of package units, the important advantages of forced draft firing are extended to the small "Scottie, Jr." sizes. Thoroughly proved in worldwide installations of larger size units, this new series makes forced draft firing, with all its benefits, available for smaller boiler plants.

Forced draft advantages. Forced draft firing has many inherent advantages over other methods of gas or oil combustion.

With these units there is a 50% saving in electrical power for operating motors. This is important, particularly in the larger sizes. More positive regulation is assured by controlling the air at room temperature, rather than at exit gas temperature. Equipment is smaller and requires less maintenance. In addition, a forced draft unit

is much quieter than a natural or induced draft unit. No high stack needed; requires only a vent pipe.

Boilers and burners conservatively rated. There is an ample reserve capacity beyond the rated output. Normal load is carried at a comfortable "cruising speed." This assures long life with low maintenance costs. Units operate at well above 80% efficiency even at 50% above the Steel Boiler Institute rating.

Only service connections required. All boiler fittings, automatic burner controls, fuel and air systems are installed and tested at factory. Units are fire tested and shipped as a unit if desired, or boiler and burner may be shipped separately if it is necessary to protect the burner from weather or vandalism during construction.

IRON FIREMAN forced draft package units

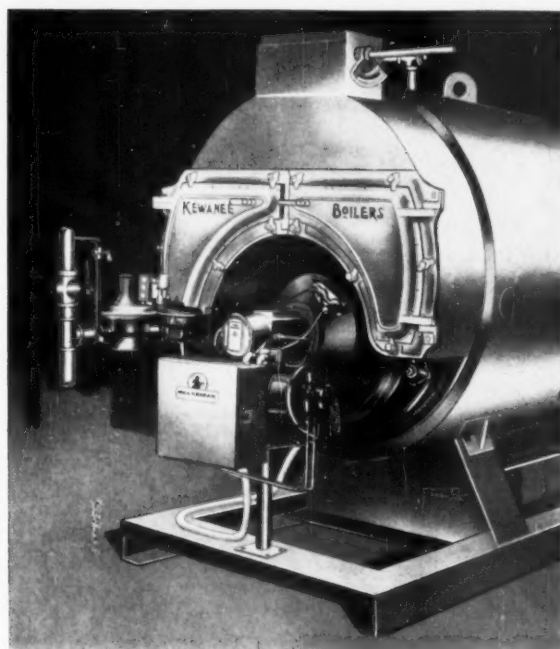
High or low pressure, steam or hot water boilers . . .
all sizes, all fuels . . . *ready to hook up and GO*

Light oil, gas or gas-oil. The Iron Fireman WhirlBlast burner is a new and advanced design. Its most outstanding feature is its ability to fire, with high efficiency, either gas or oil in a sealed combustion chamber, without flame pulsation. It is a true forced draft burner operating under firebox pressure. On dual fuel models, fuels are changed without mechanical adjustment, either through automatic controls or with the flick of a switch. From 18 to 92 bhp.

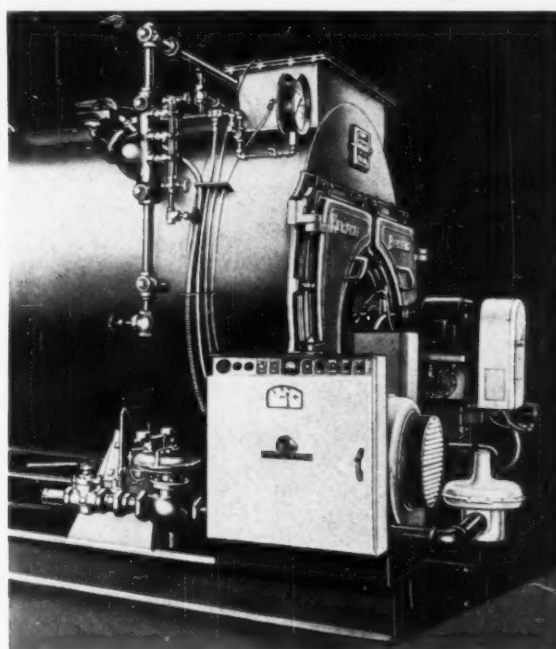
Heavy oil burner for smaller boilers. The ability to fire either heavy or light oils and to modulate over a wide range are the two outstanding features that make the MicroMist burner unique in its field. Its most notable feature is a two-stage supercharger atomizing principle which converts fuel oils, up to and including No. 5, to an air-oil mist that is readily ignited by an electric spark. No gas pilot required. For boilers from 18 to 92 bhp.

No. 6 oil or lighter—gas or gas-oil.

This burner is designed for larger size boilers. Oil models incorporate the famous Iron Fireman horizontal rotary burner with Volumeter oil control, which accurately meters, by positive displacement, all grades of oil. The integrated ring type gas burner operates at highest efficiency at the same input ratings as are developed with oil. Available in sixteen sizes with capacity ranging from 59 bhp to 651 bhp.



Iron Fireman WhirlBlast burner (described above) fires either gas or light oil, or combination oil and gas, under forced draft. This is a new Iron Fireman development; never before available in the medium size range.



The Iron Fireman rotary forced draft burner (described above) fires any grade of oil, gas or gas-oil combination. It includes control panel, air and fuel systems. Control instruments are wired and tested at factory.



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Atoms in Action

nection with problems associated with implementation of the bilateral agreement for cooperation concerning uses of atomic energy.

THE U.S. AIR FORCE has designed a high intensity gamma irradiation facility capable of handling 100,000 curies of cobalt-60 for research on effects of radiation on materials. The facility contains a radioactive source stored in a water well in an underground irradiation room 12 feet square. Plans include laboratory utilities, with valves and switches located on a control panel in an adjacent building, and a closed circuit television system. Experimental apparatus is equipped with instruments that would eliminate general purpose manipulators. Plans and construction drawings are contained in "Design of a High-Intensity Gamma Irradiation Facility," Catalog No. PB 13116, 54 pages, \$1.50 from the Office of Technical Services, U.S. Department of Commerce, Wash. 25, D. C.

THE THIRD ATOMS FOR PEACE mission to the American Republics visited Nicaragua, El Salvador, Guatemala, and Honduras during the month of November. The seven-man U.S. group met with scientists, educators, and government officials to exchange ideas on using isotopes and radiations to assist agriculture and medicine in Central America. Adaptation of existing educational facilities to provide training of specialists and technicians and possible U.S. cooperation in this effort were discussed.

PAPERS from sessions of its recent conference, "The 1957 Nuclear Industry," are available from the Atomic Industrial Forum, 3 East 54th St., New York 22, N.Y. A catalog listing the sets of papers will be sent upon request without charge.

YANKEE ATOMIC Electric Co. has been issued a construction permit by the AEC for its Rowe, Mass., 134,000-kw power reactor plant. The permit is conditional since Yankee has not completed the design of the reactor, and certain features of the proposed facility may affect its safe operation. The permit was issued at this time to allow Yankee to obtain adequate financing.

GEORGE, who can play chess, figure the orbit of a satellite, or pick probable winners in next week's football games, is at work at Argonne National Laboratory performing scientific computations and mathematical reductions of research data. GEORGE, a new high

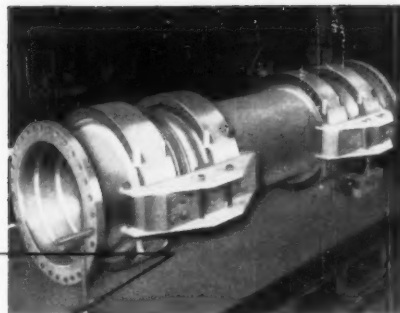
THE NS SAVANNAH, the first U.S. nuclear powered merchant ship, will be built by New York Shipbuilding Corp. on a fixed price basis for \$20,908,774. The contract calls for construction of the ship and for installation and testing of the nuclear propulsion system, which will be furnished by Babcock and Wilcox Co. The ship was designed by George G. Sharp, Inc., New York, the firm that prepared the contract plans and specifications and performed associated engineering work for the vessel. The nuclear power plant will be an advanced pressurized water design, and the propulsion equipment will consist of a steam turbine connected to a single propeller shaft through double reduction gears.

ADVICE ON specifications and site selection for a research reactor that the Turkish government hopes to build soon will be furnished by an Argonne National Laboratory chemical engineer, Leonard E. Link. Turkey had requested planning assistance from the Atomic Energy Commission, which in turn relayed the request to Argonne National Laboratory.

AN ULTRASONIC RECORDER developed to test fuel elements for atomic reactors has been employed at Argonne National Laboratory for "photographing" the bones of a human arm without X-rays. The scanner machine, an assembly consisting of two crystals, one to transmit and one to receive ultrasonic waves, traces across the fuel element (or human arm) a saw-tooth pattern in very narrow lines. Electro-sensitive paper is attached to the ultrasonic recorder. Flaws show up on the paper as white spaces.

THE AEC has opened an office in Tokyo, Japan, to assist in the scientific and technical aspects of atomic energy developments in Japan, including liaison with the Japanese atomic energy authorities and scientists in con-

ALL IN A DAY'S WORK at *Pittsburgh Piping*



Every Pittsburgh Piping job is different, but all are alike in one respect . . . to control the flow and harness the energy of high temperature steam, gases, or liquids at high pressures. It's all in a day's work at Pittsburgh Piping to fabricate piping for a central station, an atomic energy installation, or for industrial and processing operations. Our service includes every phase from blueprint through erection: engineering, metallurgical control, pipe bending, machining, welding, heat treating, inspection, and testing. Use these facilities on your high temperature, high pressure piping jobs.

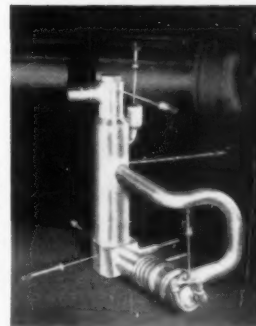
this BIG **10-TON** EXPANSION JOINT

36" carbon steel joint, weighing ten tons, for cross-over piping in central station.



and this small **PRESSURE RISER CONDENSER**

Pressure riser condenser, fabricated of Stainless Steel Type 347; 2 feet high; wall thickness equivalent to 4" Schedule 160S. Stainless steel pressure vessel, for atomic energy application, appears in background.



Promoting Progress **IN POWER AND PROCESS PIPING**

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speed digital computer capable of making 200,000 separate additions of numbers a second, was designed and built by Argonne. Cost was approximately \$303,000, which is about one-sixth the cost of comparable commercially produced machines, not including the cost of the developmental work and the time spent by salaried Laboratory personnel.

GENERAL ELECTRIC Research Laboratory scientists have developed a technique for converting heat to electricity without using moving parts. A thermionic converter consisting of two electrodes is used. One electrode is cooled, the other is heated to 2500 F. The heat literally boils electrons out of the metal. They travel through a field of positively charged particles between the electrodes to form an electrical current. To date the apparatus has been able to generate about $\frac{1}{2}$ a watt of direct current at 0.8 volt. In the future it may be possible to use thermionic conversion to change heat from a nuclear reactor to electricity without the conventional boiler-vapor-turbine-generator arrangement.

BABCOCK & WILCOX CO., prime contractor for the development of the Liquid Metal Fuel Reactor Experiment, has announced three subcontractors for various phases of the project. Union Carbide Nuclear Co. will provide consultation in the field of chemical processing of the uranium-bismuth liquid fuel. Walter Kidde Nuclear Laboratories, Inc. will provide engineering and design services for remote maintenance and handling equipment. A. D. Little, Inc. is to conduct a feasibility study of the application to the experiment of a continuous uranium concentration measuring system.

ILLUSTRATING THE COST of research and development that is required in the atomic power field, Charles H. Weaver, vice president of Westinghouse Electric Corp., in his keynote address at the Atomic Industrial Forum meeting in October, pointed out that for every dollar spent on the actual construction of the reactor portion of the Shippingport plant, including its first fuel loading, there has been 80¢ spent on research, development, and design related to that specific plant.

AEC is planning to process, in existing Commission radiochemical facilities, for an interim period, the irradiated fuel elements discharged from research and power reactors. The decision was reached after an AEC survey showed that the private chemical industry is not ready to undertake the service.

ADVANCED RESEARCH studies of the nuclear effects on ceramics will be conducted by Gulton Industries, Inc., at Brookhaven National Laboratory, where Gulton maintains a research staff. The studies will concentrate on electrical measurements of irradiated materials with the hope that by changing the structure of the ceramic materials improved electrical characteristics will also be effected.

COMMERCIAL APPLICATION of atomic power on a profitable basis is the subject of the American Management Association's Special Report 21, "Profit Perspectives in Atomic Energy," 176 pp., \$4.75 (\$3.50 to AMA members). Topics covered include: world mar-

kets for atomic power; objectives and methods of government control of atomic energy; patents and information control under the atomic energy law; and manpower needs of effective atomic programs. Also considered are problems arising in atomic hazard insurance, including third-party liability, government indemnification, supplier's problems, and determining the premium.

GOLD-198, with a 64-hour radioactive life, used to measure flow rates of natural streams, decays so fast and its longitudinal mixing in the stream is so thorough that a man swimming right through a test batch of the gold would be exposed to only 0.0025 milliroentgens, reported D. E. Hull, of the California Research Corp. of the Standard Oil Company of California. Speaking at the 8th National Conference on Standards, he outlined safety standards in the research labs and petroleum refineries of his company.

INDUSTRIAL FIRMS have been invited by AEC to submit proposals for preliminary studies on compact nuclear reactor systems for military use. Purpose of the studies is to determine reactor concepts that show most promise for use in military applications demanding a mobile power plant with moderate power rating — 2000 kw — extreme compactness, and low operating weight.

A **HANDBOOK** on nuclear operations in the U.S., "Atomic Energy Facts," recently issued by the Atomic Energy Commission, combines and organizes material from many Commission sources. It describes organization and functions of the Commission; its technical services and how to use them; conditions for access to classified information, special materials, and services available from AEC; and how to obtain patents and licenses. \$2.00 from the Superintendent of Documents, U.S. Government Printing Office, Wash. 25, D. C.

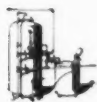
DEVELOPMENT of the food irradiation reactor for the Army has been halted by the Atomic Energy Commission while the Department of Defense investigates alternative sources of gamma irradiation such as long-lived radioisotopes or spent reactor fuel elements. Kaiser Engineers had been working on the FIR project for AEC.

THE MARITIME ADMINISTRATION and AEC have received 18 proposals to develop a gas cooled nuclear power plant suitable for propelling merchant ships in response to their August 1 invitation. The firm chosen will carry out necessary development work toward design of a land based prototype plant.

SCIENTISTS at the University of Chicago and Argonne National Laboratory have proved that the law of "parity conservation" does not apply in the radioactive decay of the neutron. Earlier this year it was demonstrated that parity did not hold for complex nuclei or mesons. The principle of parity would indicate that the electrons produced by the decay of the neutron should be emitted equally toward both poles (comparing the neutron to a tiny magnet spinning on an axis running from its north to south pole). Results of the new investigation proved that only about 62 percent as many electrons come off in the direction of the south pole as in the direction of the north pole. ▲▲



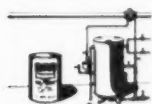
ZEOLITE WATER SOFTENER — manual and automatic. Up to 44% more soft water output from a softener of given size.



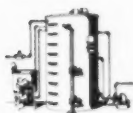
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How'll you have your water?

THE answer to "How'll you have your water?" depends on whether *you* are drinking it or your *plant* is drinking it. When the water is for boilers or industrial processes, it pays to be all-fired particular about every drop of it.

That's where Elgin comes in: Elgin methods and equipment can take your raw water and "make it over" into water with the exact characteristics you require. Since Elgin systems embrace all sound methods, Elgin recommendations are necessarily unbiased. The only question asked is, — what method gives exactly what is needed at the lowest possible cost?

And nearly a half century of specialization goes into the Elgin answer to that vital question!

Some of the Elgin systems that may fit your needs are listed here . . . and there are many more that can be "tailored" to your specific needs.

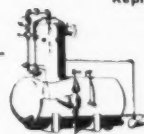
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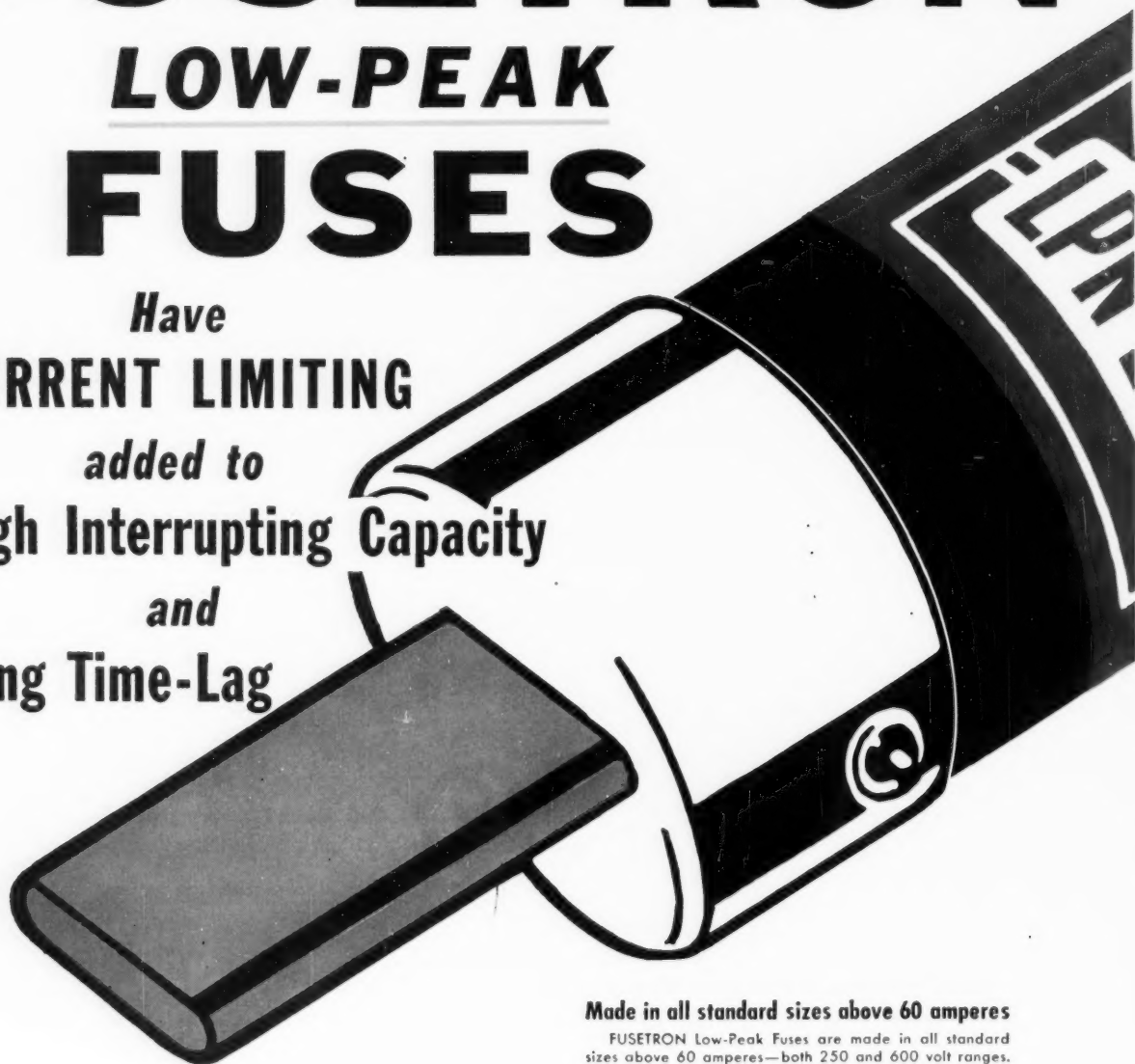
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soon to be available by the
makers of BUSS FUSES

FUSETRON

LOW-PEAK

FUSES

Have
CURRENT LIMITING
added to
High Interrupting Capacity
and
Long Time-Lag



Made in all standard sizes above 60 amperes

FUSETRON Low-Peak Fuses are made in all standard sizes above 60 amperes—both 250 and 600 volt ranges.

In 60 amperes and smaller sizes tests show that FUSETRON dual-element fuses have sufficient current limitation to protect circuit and components in all normal cases.



Now you can have a high degree of protection against the thermal and mechanical stresses that heavy fault currents often impose on switches or other circuit components.

FUSETRON Low-Peak Fuses have a current limiting element that cuts off fault current so fast that it cannot build up to a damaging peak.

These new FUSETRON Low-Peak Fuses are built on the same principle as FUSETRON dual-element Fuses. They have:

the same High Interrupting Capacity
the same Time-Lag to hold harmless current surges

PLUS Greater Current Limitation to restrict fault currents to a LOW PEAK

FUSETRON Low-Peak Fuses can be interchanged with FUSETRON dual-element Fuses.

Where their use is required in any part of the

electrical system, they can be installed without upsetting proper coordination over the range of useful loads and normal faults.

Hence, their application requires no testing or complicated calculations.

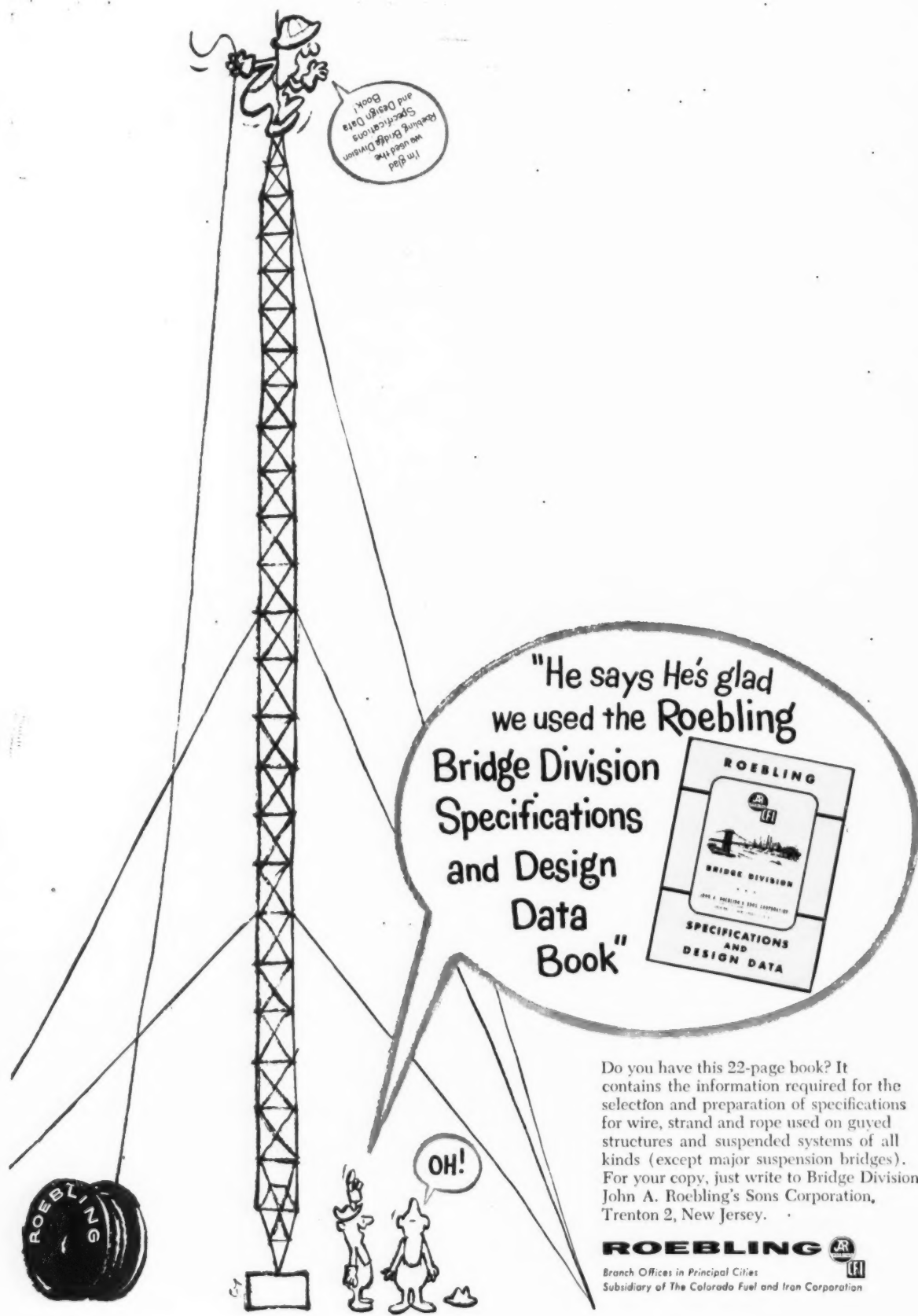
They are designed for use to protect circuits and components that might be damaged by the thermal and mechanical stresses of peak fault currents if other protective devices are used.

If planning new installations, keep FUSETRON Low-Peak Fuses in mind for those locations where peak fault current must be held to a low value.

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Do you have this 22-page book? It contains the information required for the selection and preparation of specifications for wire, strand and rope used on guyed structures and suspended systems of all kinds (except major suspension bridges). For your copy, just write to Bridge Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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Report from the West Coast

RALPH S. TORGERSON
CONSULTING ENGINEER CORRESPONDENT

CE exclusive THE STRUCTURAL ENGINEERS Association of California held its annual meeting Oct. 31 to Nov. 2, at the Hotel del Coronado, Coronado, Calif. "Seismic Code Standards" and "New Methods in Concrete Construction" were two subjects on the technical program that attracted a record attendance. President Henry M. Layne opened the convention with a welcoming address. Coleman Gray, Mayor of Coronado, and Joseph Mark, San Diego County Engineer, gave brief welcoming talks.

A panel discussion on data developed by the Association's special seismic code committee in a study for unlimited height building codes was led by R. W. Binder, chief engineer, Bethlehem Pacific Coast Steel Corp. The study was made in response to a request from the Board of Building and Safety of the City of Los Angeles. Objectives of the committee were: (1) to work toward a uniform seismic code on a national basis and, in particular, for California; (2) to evaluate the results of pertinent current research and findings; (3) to give consideration to the Los Angeles City code, determining whether the present code for 150-ft height limit is satisfactory in the light of present knowledge; and (4) to determine and state the extent to which the seismic code should provide protection to nonstructural elements when such damage is not considered hazardous to health and safety. In July 1957 the committee brought out a report of interim recommendations for uniform structures that subsequently was approved by the Board of Building and Safety and adopted by the Los Angeles City Council.

Before introducing Ed Lindskog, Calcor Corp., panel discussion moderator S. B. Barnes, S. B. Barnes and Associates, commented on the difficulty of arranging complex engineering data into a form that structural engineers can use in a design formula.

Mr. Lindskog reviewed the basic criteria established by the 1956 special seismic committee, and gave a brief description of the triangular distribution method of spreading base shear as well as a brief analysis of the old Los Angeles City formula. Seismic load distribution for low buildings and an entirely different form for tall buildings are used with this formula.

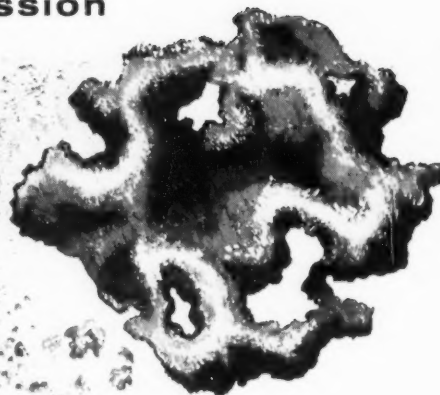
A paper by C. S. Glazbrook, of Holmes and Narver, Inc., delivered by Mr. Binder, explained that horizontal earthquake loads produce torsion in a building when the center of mass above selected level does not coincide with the center of gravity of the vertical bracing elements at that level. Latest shear formula for use in evaluating the seismic shears in a building are based on a single mass, spring-mounted, and vibrating back and forth in the direction of the shock. When torsion occurs,

NEW PRESIDENT OF THE STRUCTURAL ENGINEERS ASSOCIATION OF CALIF. IS H. J. DEGENKOLB OF THE SAN FRANCISCO FIRM, J. J. GOULD & H. J. DEGENKOLB, CONSULTING ENGRS.



Dust Particle

with a mission

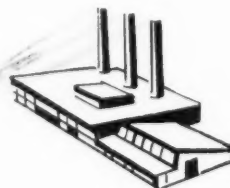


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The Aerotec Corporation is experienced in the quantitative measurement of all dust properties and is equipped to carry out these tests before a recommendation for equipment is ever made. This ability, plus the most advanced design of both mechanical and electrostatic dust collectors, makes The Aerotec Corporation the logical choice to solve your dust collection problems.

Our Project Engineers, located in most principal cities in the United States and Canada, will be happy to supply you with information and literature on either mechanical, electrostatic or series dust collectors.



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another degree of freedom is introduced, since the mass will have a torsional period of vibration which may add to and greatly increase the shears over those contemplated. With improperly located or designed bracing, a building may tend to rotate clockwise at one level and counterclockwise at another level.

Overturning

Roy G. Johnston, Brandow and Johnston, on the subject of overturning, pointed out that formulas and rules represent average conditions for average buildings. The formulas and codes are only guides, and each designer must exercise sound engineering judgment. "We need to know," he said, "the limitations of our formulas, to understand the structure to determine where and when to expect damage, and to evaluate properly initial, reserve, and accidental strength in the structure."

M. J. Skinner, Murray Erick Associates, speaking on the subject of drift, said that the Los Angeles code requires an external allowance for drift by prescribing a separation between adjacent buildings, the amount being 0.004 in. per inch of height. The intent of this provision is to permit seismic or wind movement without buildings battering against one another. He further commented that "observations of damage between adjacent buildings in the recent Mexican earthquake may lead us to feel that our code separation requirements are barely adequate." He recommended that an elastic analysis of drift should be made to guarantee an adequate design.

Diaphragm Considerations

John Steinbrugge, State Division of Architecture, spoke on diaphragm considerations. Mr. Steinbrugge urged the use of a greater seismic coefficient for walls and parapets than those used in present or past codes. He pointed out the danger of portions of the wall tumbling into the

One of a series.

Some Things to Think About Steam Traps

...in order to get high operating efficiency and a minimum of maintenance

The gentleman who invented the wheel had a basic idea and so far no one has come up with anything better for the purpose.

If you'll pardon us for a little overemphasis on the significance of steam traps, we'd like to liken one of them to the wheel.

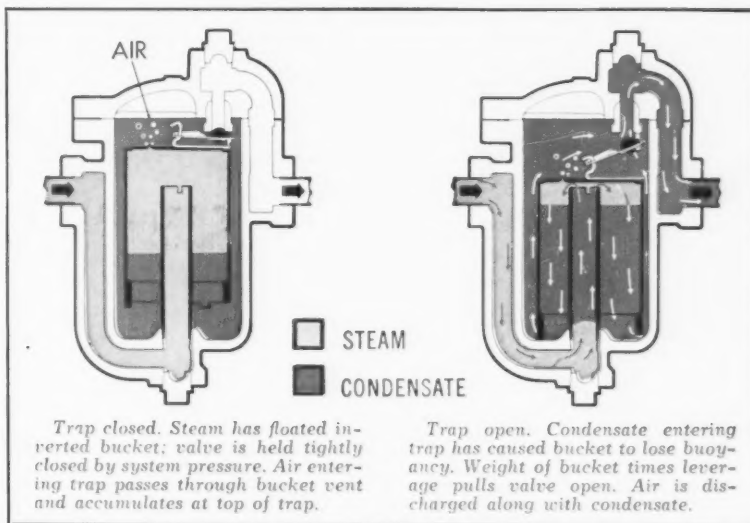
In 1911, when the first Armstrong inverted bucket steam trap model was announced to the world, or at least that part of the world that modest advertising and sales budgets would cover, it was not received with equal enthusiasm by all (especially old-style trap makers). But, like the wheel, it managed to find its way into general use. And, nothing better has ever turned up for the purpose of draining condensate. As a matter of fact, the Armstrong trap has been very widely copied. Today, there are more inverted bucket traps draining process equipment than any other kind. Of these, there are more Armstrongs.

If this sounds like the boasting of a proud parent, give consideration to some fundamental requirements not met by all traps:

1. **A steam trap should not leak steam.** Some traps do, you know, because of the nature of their operating principle. No steam ever gets to the Armstrong trap orifice. The valve is always water sealed.

2. **A steam trap should vent "air" as fast as it accumulates—**otherwise temperatures are reduced and corrosion is a problem. The Armstrong trap handles air very nicely. The vent in the bucket permits air to accumulate in the top of the trap, from where it is discharged when the trap opens. For extreme conditions like draining paper machine dryers, some jacketed kettles and certain other units, the vent is sized larger for the job. And, for handling big volumes of air during warm-up, a bucket with an auxiliary thermic vent really speeds up heating.

3. **A steam trap should discharge condensate at steam temperature** if you want to get



maximum efficiency from the unit drained. And most people certainly do. If you have to wait for the condensate to cool, it's almost impossible to maintain maximum temperatures and prevent air build-up. You guessed it—the Armstrong trap opens for water, without dependence on temperature.

4. **A steam trap should be suitable for any return system.** The Armstrong trap works just the same whether discharging to atmosphere, back pressure or vacuum. It has been conclusively proved that flash steam resulting from use of a bucket trap does not cause a problem in vacuum return systems. The flash condenses rapidly. It's the leaky traps that cause the headaches.

5. **A steam trap should not be a "prima donna".** Some kinds of traps take an awful lot of care and coddling. The Armstrong trap is a rough and ready type with a hardened chrome steel constitution (valve and seat, to be exact). It cleans itself of ordinary dirt and scale without choking up. Its 18-8 stainless parts stave off rust and corrosion. It resists wire-drawing and wear remarkably well. In fact,

it stays on the job longer with less attention than any trap ever produced. Unless you live in Siberia, you can probably find a user around the corner who will tell you so from experience.

6. **A trap should not be an "orphan".** With Armstrong traps you can *always* get prompt service and parts from nearby Factory Representatives and stocking distributors as well as from the factory.

7. **A trap should have a guarantee.** The Armstrong trap is unconditionally guaranteed to give you complete satisfaction (as to doing its job, that is). If it doesn't, you can get your money back.

If you'd like to buy some of these excellent steam traps, call your local Armstrong Representative or write, **Armstrong Machine Works, 9651 Maple St., Three Rivers, Michigan.**

ASK FOR the 44-page Steam Trap Book, free on request without obligation.

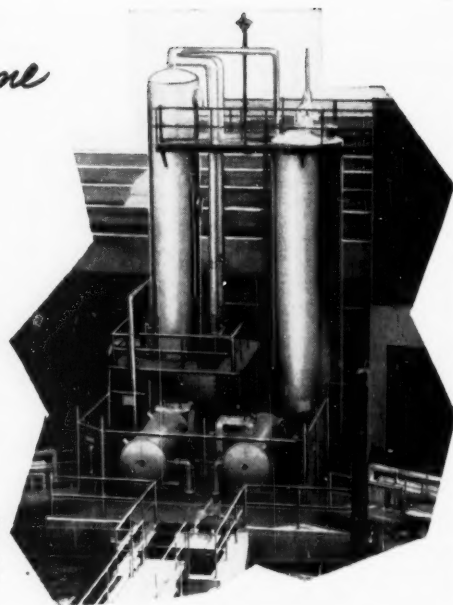


**ARMSTRONG
STEAM TRAPS**

WELSBACH

Ozone

... used by
Boeing
for
oxidation
of
cyanide
wastes



Ozone plant for cyanide oxidation at Boeing Airplane Company's new industrial waste treating plant. In the foreground are the two Welsbach Ozonators.

Application of ozone to the oxidation of cyanide wastes is solving one of the most acute problems in the aircraft and process industries today. Should it be necessary, ozone is capable of producing an effluent of such purity as to permit direct disposal to drinking water supplies.

Rapid expansion of industry has accentuated the acuteness of the problem of toxic waste disposal. The commonly accepted chemical oxidants for cyanide removal, chlorine and hypochlorite, are likely to leave excess chlorine or chlorides in the effluent. These residuals can be as undesirable as the toxic component of the original waste.

Ozone leaves no toxic residual. Its rapid reaction completed, any excess ozone soon reverts to ordinary oxygen.

Ozone's rate of reaction is so rapid that it lends itself readily to continuous treatment, or it may be used on a batch basis in simple holding tanks. Such application provides considerable savings in space and cost compared to chlorination which requires large mixing and detention basins. The elimination of purchasing, freight, storage and handling problems further reduces overall cost.

Welsbach pioneered the development of dependable, long-life ozonators for laboratory and tonnage ozone production. Ozone has many other chemical process applications, and it is more than likely that if you have a process calling for an oxidant, ozone will do the job better and at less cost. Call on Welsbach when you have such a problem.

Welsbach will be glad to send you specific information on the use of ozone in cyanide waste disposal. Write us about your problem today.



Write for this booklet on Welsbach Ozone Generation for Industrial Application. Please indicate company and title.

THE WELSBACH CORPORATION

Ozone ZONE PROCESSES DIVISION

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street and said that a larger factor for walls imposes no great economic penalty on conventional construction.

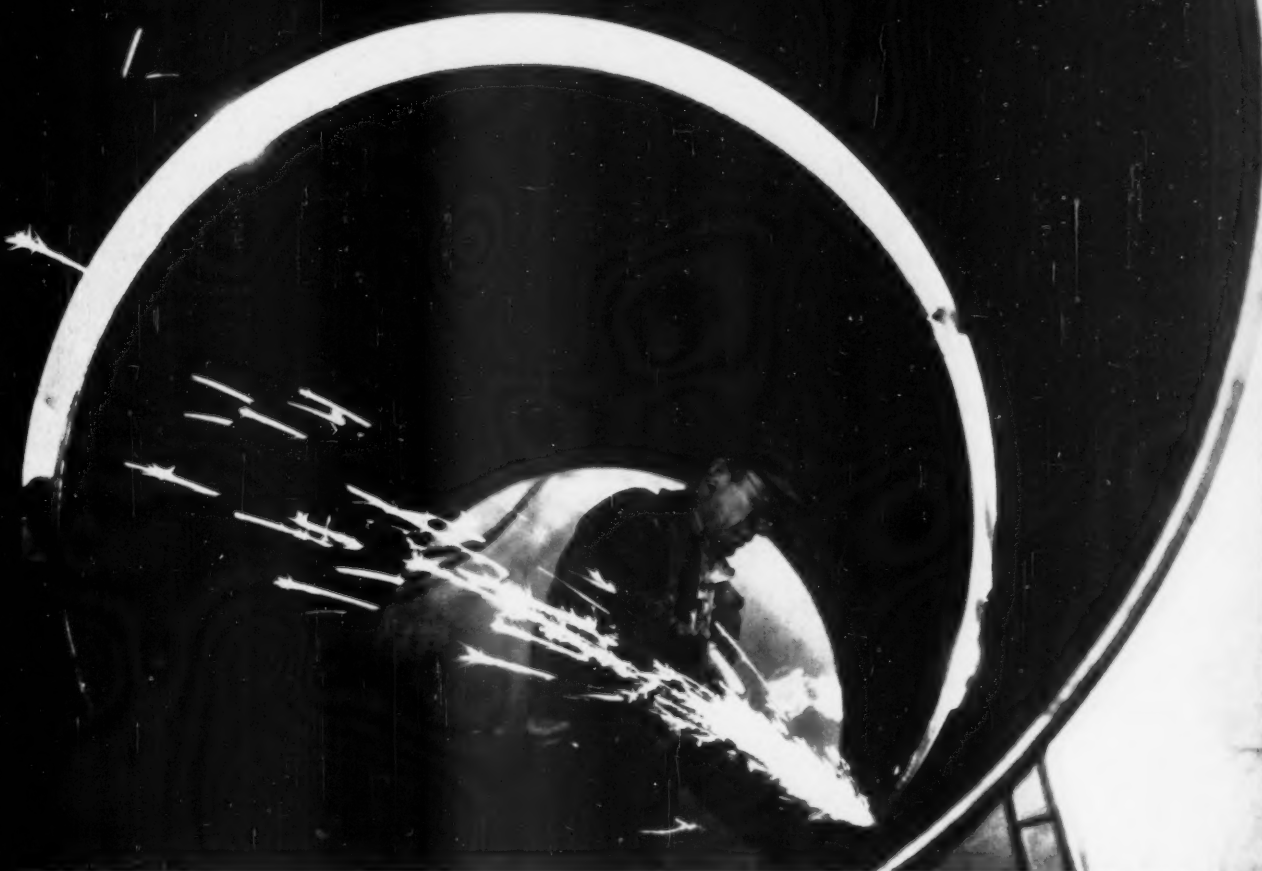
John A. Blume, consulting structural engineer, San Francisco, reported on "Reaction of Traditional and Modern Buildings to Earthquakes." The findings were based on research, utilizing special electric analog equipment, providing the reactions of 16 different 20-story buildings to four earthquakes; El Centro, 1934; El Centro, 1940; Santa Barbara, 1941; and Olympia, 1949. Variations in building rigidity and damping cause wide variations in the seismic shears. This work was done in collaboration with the Dominion Physical Laboratory located in New Zealand.

Aseismic Design

Dr. Emilio Rosenblueth, research professor, Institute of Geophysics and Engineering, University of Mexico, covered the subject of aseismic design. He said that the traditional method was to design for a certain maximum intensity under the conviction that no damage will take place provided that intensity is not exceeded. No attention is given to what will happen if that intensity is exceeded. The other tendency in aseismic design, which seems more sensible, is to design so that below a certain intensity the chances of damage are negligible. For greater intensities the likelihood of local damage is accepted but the designer tries to eliminate the possibility of collapse. Commenting on the recent earthquake, he said that Mexico's soft ground prolonged strong vibrations, and this created more fright among tenants. Panic receives prime consideration in Mexico.

Murray Erick, Murray Erick Associates, summarized this panel discussion calling attention to the many buildings that had performed reasonably well under the impact of past earthquake forces, even though the buildings had not been designed for forces compar-

Specify RECO



Boiler Plant, West Wing and Mercy Hall—
St. Mary's Hospital, Knoxville, Tenn.
Consulting Engineers—A. F. G. Bedinger,
Knoxville, Tenn.—H. F. Wilson, St. Louis, Mo.
Architects—David B. Liberman, Knoxville,
Tenn.—Maguolo & Quick, Cincinnati, Ohio
Contract—John F. Whelan Co., Knoxville, Tenn.
RECO Representative—Dickey Engineering Co.,
Knoxville, Tenn.

Hot Water Treatment by RECO for St. Mary's Hospital

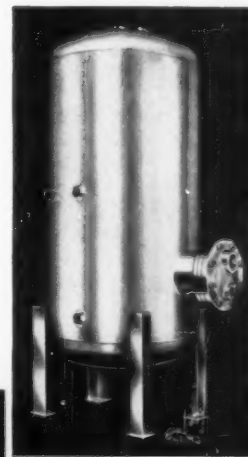
When it comes to hot water, a hospital really pours it on. That's why the consulting engineer "prescribed" RECO water heating equipment for the new buildings at St. Mary's.

The complete RECO installation includes convertors, storage heaters, expansion and bulk storage tanks. 17 units in all... Guaranteed to keep plenty of rust-free hot water always on tap.

If you're interested in guaranteed top quality heat exchange equipment—delivered quickly and priced right—SPECIFY RECO on your next heating job.

Write for free catalogs plus name of nearest RECO representative.

Dept. N, Richmond Engineering Co., Inc., 7th & Hospital Sts.,
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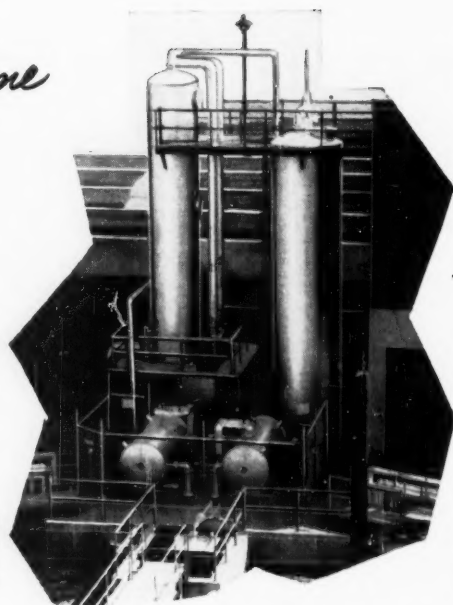


RICHMOND ENGINEERING CO., INC.

WELSBACH

Ozone
... used by
Boeing
for
oxidation
of
cyanide
wastes

Ozone plant for cyanide oxidation at Boeing Airplane Company's new industrial waste treating plant. In the foreground are the two Welsbach Ozonators.



Application of ozone to the oxidation of cyanide wastes is solving one of the most acute problems in the aircraft and process industries today. Should it be necessary, ozone is capable of producing an effluent of such purity as to permit direct disposal to drinking water supplies.

Rapid expansion of industry has accentuated the acuteness of the problem of toxic waste disposal. The commonly accepted chemical oxidants for cyanide removal, chlorine and hypochlorite, are likely to leave excess chlorine or chlorides in the effluent. These residuals can be as undesirable as the toxic component of the original waste.

Ozone leaves no toxic residual. Its rapid reaction completed, any excess ozone soon reverts to ordinary oxygen.

Ozone's rate of reaction is so rapid that it lends itself readily to continuous treatment, or it may be used on a batch basis in simple holding tanks. Such application provides considerable savings in space and cost compared to chlorination which requires large mixing and detention basins. The elimination of purchasing, freight, storage and handling problems further reduces overall cost.

Welsbach pioneered the development of dependable, long-life ozonators for laboratory and tonnage ozone production. Ozone has many other chemical process applications, and it is more than likely that if you have a process calling for an oxidant, ozone will do the job better and at less cost. Call on Welsbach when you have such a problem.

Welsbach will be glad to send you specific information on the use of ozone in cyanide waste disposal. Write us about your problem today.



Write for this booklet on Welsbach Ozone Generation for Industrial Application. Please indicate company and title.

THE WELSBACH CORPORATION

Ozone ZONE PROCESSES DIVISION

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street and said that a larger factor for walls imposes no great economic penalty on conventional construction.

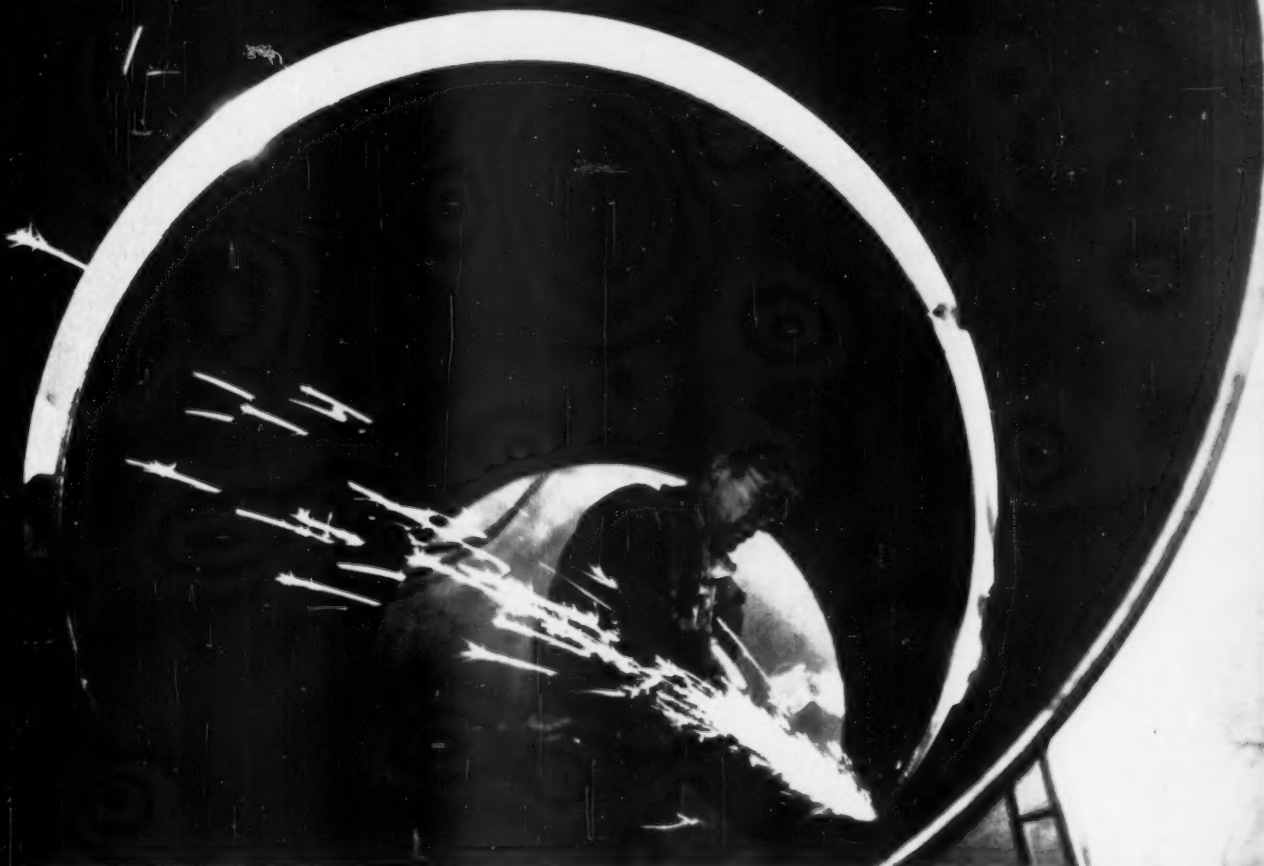
John A. Blume, consulting structural engineer, San Francisco, reported on "Reaction of Traditional and Modern Buildings to Earthquakes." The findings were based on research, utilizing special electric analog equipment, providing the reactions of 16 different 20-story buildings to four earthquakes; El Centro, 1934; El Centro, 1940; Santa Barbara, 1941; and Olympia, 1949. Variations in building rigidity and damping cause wide variations in the seismic shears. This work was done in collaboration with the Dominion Physical Laboratory located in New Zealand.

Aseismic Design

Dr. Emilio Rosenblueth, research professor, Institute of Geophysics and Engineering, University of Mexico, covered the subject of aseismic design. He said that the traditional method was to design for a certain maximum intensity under the conviction that no damage will take place provided that intensity is not exceeded. No attention is given to what will happen if that intensity is exceeded. The other tendency in aseismic design, which seems more sensible, is to design so that below a certain intensity the chances of damage are negligible. For greater intensities the likelihood of local damage is accepted but the designer tries to eliminate the possibility of collapse. Commenting on the recent earthquake, he said that Mexico's soft ground prolonged strong vibrations, and this created more fright among tenants. Panic receives prime consideration in Mexico.

Murray Erick, Murray Erick Associates, summarized this panel discussion calling attention to the many buildings that had performed reasonably well under the impact of past earthquake forces, even though the buildings had not been designed for forces compar-

Specify RECO



Boiler Plant, West Wing and Mercy Hall—
St. Mary's Hospital, Knoxville, Tenn.
Consulting Engineers—A. F. G. Bedinger,
Knoxville, Tenn.—H. F. Wilson, St. Louis, Mo.
Architects—David B. Liberman, Knoxville,
Tenn.—Maguolo & Quick, Cincinnati, Ohio
Conts.—John F. Whelan Co., Knoxville, Tenn.
RECO Representative—Dickey Engineering Co.,
Knoxville, Tenn.

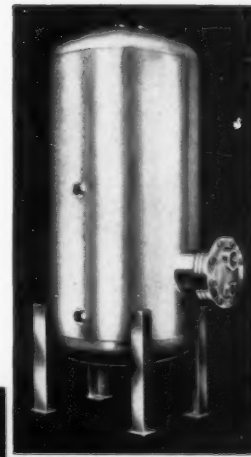
Hot Water Treatment by RECO for St. Mary's Hospital

When it comes to hot water, a hospital really pours it on. That's why the consulting engineer "prescribed" RECO water heating equipment for the new buildings at St. Mary's.

The complete RECO installation includes convertors, storage heaters, expansion and bulk storage tanks. 17 units in all... Guaranteed to keep plenty of rust-free hot water always on tap.

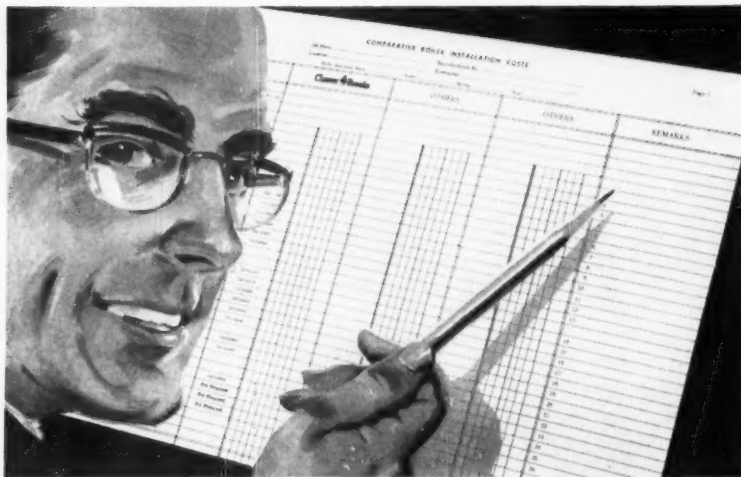
If you're interested in guaranteed top quality heat exchange equipment—delivered quickly and priced right—SPECIFY RECO on your next heating job.

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RICHMOND ENGINEERING CO., INC.

Before you buy any boiler compare quoted prices with **REAL COSTS**



New Cleaver-Brooks cost analyzer clears "quotation" confusion — reveals ALL costs

Get *all* the costs...the *real* costs...down on paper before you recommend or specify a boiler to your clients. On many boiler installations "quoted prices" seldom agree with the total costs, as you may have learned. This is frequently the case with so-called "built-up" boilers assembled on the site.

Cleaver-Brooks' cost analysis enables you to compare all material costs (boiler, steam trim, burner, refractory, controls and other equipment) and installation labor costs. You'll know the "real costs" on the complete installation before you start.

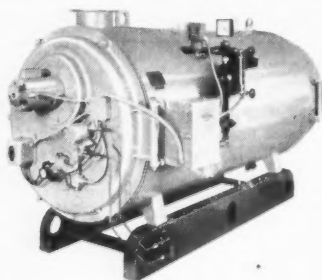
Real eye-opener

The figures you'll see may be startling. In most cases the cost analysis proves a Cleaver-Brooks costs *less*. On-job time is dras-

tically reduced because Cleaver-Brooks packaged units are fully assembled, ready to install. Cleaver-Brooks boilers give you more in performance, too...each boiler is fully fire-tested at the factory under load, tuned to peak economy. Starting service and on-the-job operator training by authorized field engineers further decreases your over-all costs.

Contact your Cleaver-Brooks agent

Once you add up all the benefits of a Cleaver-Brooks "one-cost" package...the proved trouble-free economy of exclusive four-pass, forced-draft design, you'll find it pays over and over to analyze costs carefully before you buy. See your Cleaver-Brooks agent for details or write Cleaver-Brooks Company, Dept. A, 321 East Keefe Avenue, Milwaukee 12, Wisconsin.



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able to the requirements of existing codes.

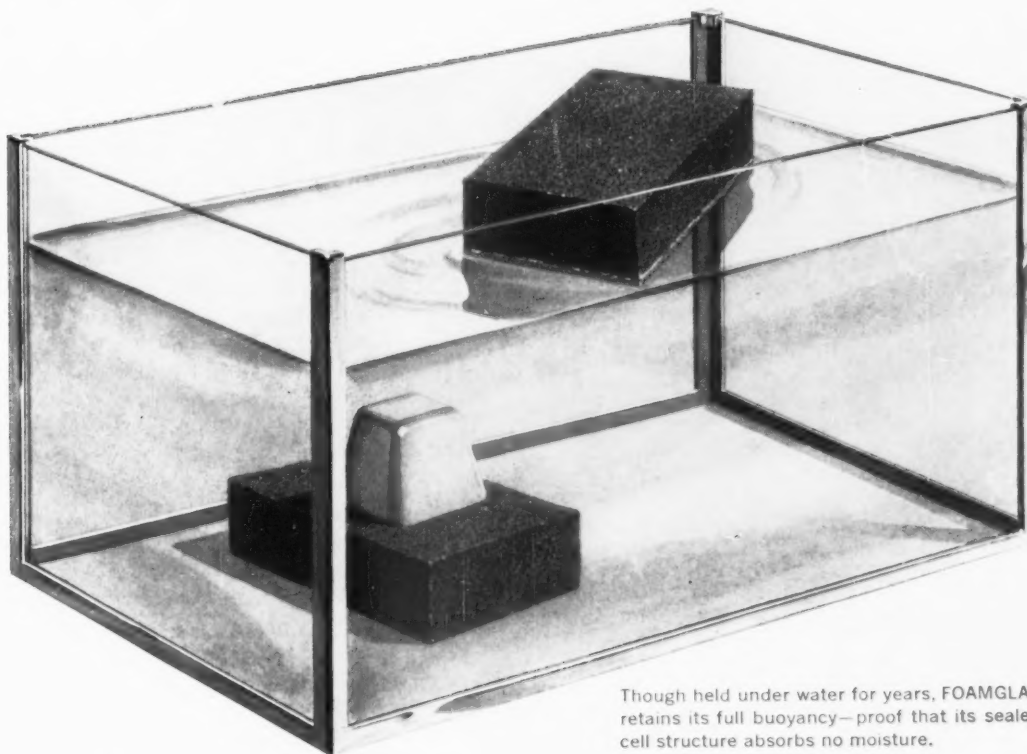
Raymond J. Schutz, technical director, Sika Chemical Corp., emphasized the importance of proper temperature and water content in attaining the greatest potential strength in concrete. He explained a new technique in vibrating concrete up to and even beyond initial set. The new method reduces air and water pockets against forms and beneath steel and aggregate. It results, he said, in an increase in density, compressive strength, and bond to steel.

Adolfo Zeevaert, civil engineer, Mexico City, told about design considerations that eliminated structural and architectural damage to the 43-story Latino Americano office building during the recent Mexican earthquake. As Mexico City is built upon an ancient lake bed, the building rests on a "floating" foundation. Wherever possible nonstructural elements were designed free of the structural members. Windows were pivoted vertically and when closed were free of the racking during building motion. Plaster fireproofing of columns and the partitions was isolated from direct contact with structural members, preventing window pane breakage or cracking of plaster.

Concrete Construction

At the technical session devoted to comparison of new methods of concrete construction, panel discussion moderator William T. Wright, of Kistner, Wright and Wright, told the group that California led all areas of the U.S. in the use of concrete construction.

Carl Wittenberg, Twaits-Wittenberg Co., told about the rapid development of the lift-slab method of construction since the first job seven years ago. It is estimated that in 1957, from 8- to 10-million square feet will be lift-slab construction. He said that it now is recognized as a means of producing the lowest construction cost and the shortest construction time under certain conditions. How-



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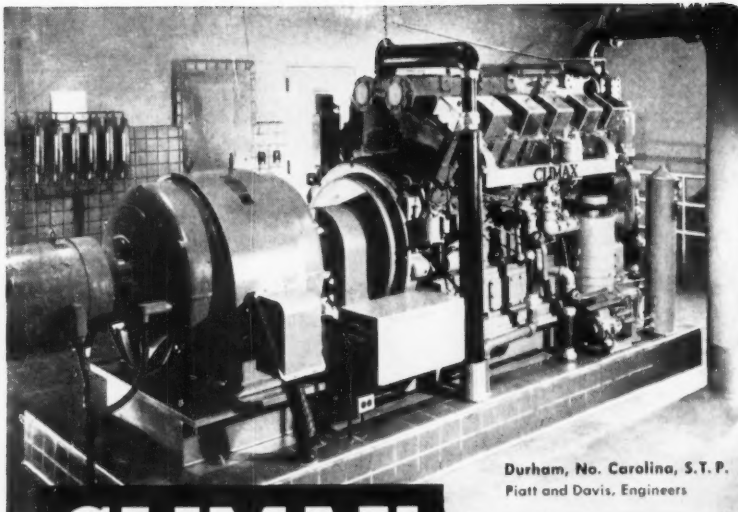
FOAMGLAS insulation stays dry before, during and after application—maintains its original insulating value on the roof, walls, piping or equipment it protects. Since FOAMGLAS is completely inorganic, it can't burn, is acid-proof and dimensionally stable. Write for latest literature



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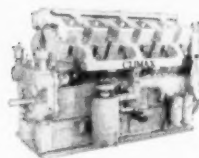
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TREATMENT
PLANTS...**

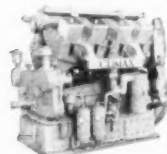
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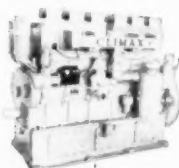
V-125—12 cylinder, 605 max. H. P.
at 1200 R. P. M.

V-122—12 cylinder, 520 max. H. P.
at 1200 R. P. M.



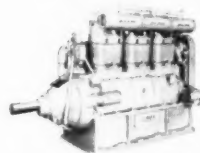
V-85—8 cylinder, 390 max. H. P.
at 1200 R. P. M.

V-80—8 cylinder, 340 max. H. P.
at 1200 R. P. M.



K-75—6 cylinder, 302 max. H. P.
at 1200 R. P. M.

K-67—6 cylinder, 265 max. H. P.
at 1200 R. P. M.



R-165—6 cylinder, 192 max. H. P.
at 1200 R. P. M.

R-110—4 cylinder, 130 max. H. P.
at 1200 R. P. M.

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ever, the lift-slab method is not always best.

J. W. Bernard, William J. Moran Co., described the economies in the use of tilt-up concrete construction. This method of wall construction did not obtain full acceptance until the insurance companies gave it the same fire and seismic ratings as poured-in-place concrete walls.

Noyes Roach, Noyes Roach Co., told about his company's experience in prestressing. In a joint venture with C. L. Peck, Noyes Roach Co. completed last year the first commercial building to utilize roof panels and girders that were precast and tensioned on the building site in special beds built by the contractor. The 120,000-sq ft structure, built for General Electric Co., Lamp Division, included 496 double tee section roof panels and 84 girders. Panel dimensions are 5 feet x 40 feet, and the girders are 18 inches x 16 inches x 26 feet. Of interest to structural engineers was the system of harping cables up or down with relation to the neutral axis of the rib on beam. This method accurately controlled the camber of the precast roof panels.

Clair L. Peck, C. L. Peck Construction and Realty, commented on conventional reinforced concrete methods. He pointed out that volumetric changes in concrete have been taken care of through expansion and control joints and air entrainment. More rigid control of field methods have permitted a 30 percent increase in working stresses with great economy. Although the monolithic character of concrete makes it an excellent material for elements of varying cross section, such as thin shells or rigid frames, concrete buildings are heavier than their steel competitors, and they are slower in construction.

Officers elected by the Structural Engineers Association of California for 1958 were: Henry J. Degenkolb, president; William T. Wheeler, vice-president; and C. D. DeMaria, secretary-treasurer.

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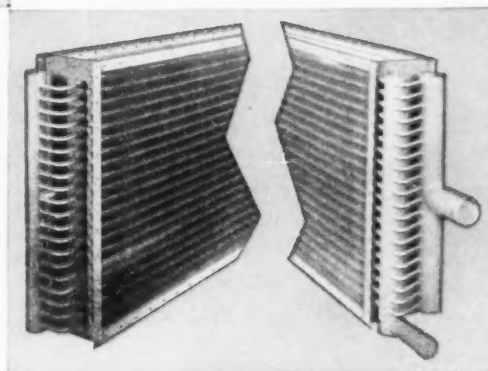


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Regardless of Fluctuating Load
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This unique new steam coil provides uniform leaving air temperatures, free of all stratification. The design also gives maximum possible protection against freeze-ups not available before.

Fins of the new Evntemp coil are of the continuous-plate type which contact the entire surface of the condensing tubes, assuring efficient, uniform heat transfer. Tubes are pitched in the casing for rapid condensate drainage and ease of installation.

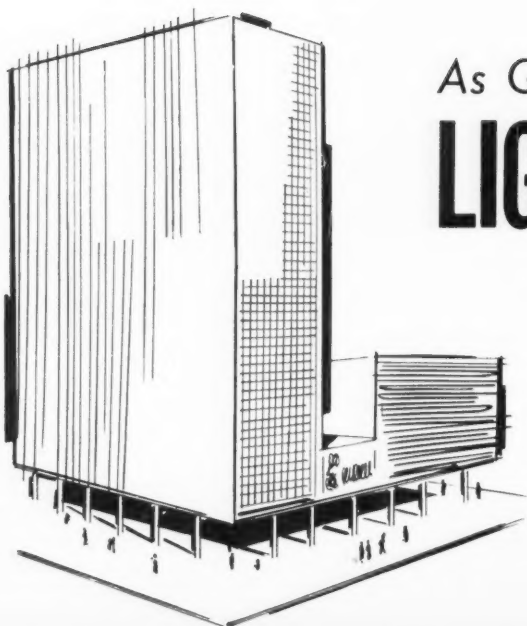
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As General Electric sees it...

LIGHTING PROGRESS

The fluorescent lighting industry has made tremendous progress in recent years. Advances in architectural styling, backed by new fixture designs and better application techniques, have brought to millions better light for modern living.

But progress almost always awakens new problems. So it is with lighting. For modern fluorescent installations, with all their style and efficiency, necessitate increasingly rigid control of ballast operating temperatures. Here's why:

New architectural designs incorporate lower ceilings, and sound-absorbing ceiling materials. Lighting fixtures are flush-mounted or recessed. There is also a growing demand for



DEMANDS BALLAST PROGRESS

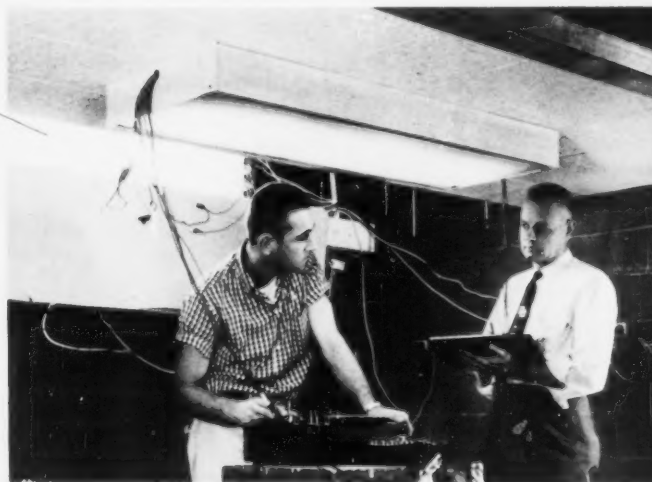
higher working foot-candles. This means more lamps per fixture and higher lamp currents. To reduce possible glare caused by higher light output, fixtures now utilize louvers or lenses, which contribute to the retention of heat. And, because space is limited, smaller cross-section ballasts are used. Thus, modern fixtures *generate more lamp and ballast heat, yet are less able to dissipate it.*

Because ballast life may be shortened if ballast temperatures are excessive, modern lighting design and application techniques place huge demands upon the ballast industry. If fluorescent lighting progress is to continue, better ballasts which will operate below standard industry heat specifications in modern applications must be developed. *Thus, lighting progress demands ballast progress.*

In working toward ballast progress, General Electric engineers have recognized that high ballast operating temperature is perhaps the largest problem to be overcome. The most important single step in solving this problem has been the development of a realistic new approach and new facilities for accurately measuring ballast operating temperatures. In a specially-constructed, temperature controlled laboratory, ballasts are actually installed in modern, totally enclosed fixtures, without the aid of heat dissipating devices (except for normal ballast base contact with the fixture channel). These fixtures are flush-mounted or recessed against typical acoustical ceilings. Thermal measurements are taken only after the ballast has reached a stable operating temperature. *Thus General Electric ballast heat measurements reflect actual, modern operating conditions.*

As a result of such research, General Electric's entire ballast line is continually undergoing major improvements designed to provide superior performance. The most recent example of G.E.'s research and development is the redesign of its 89G545 line of 40-watt, rapid-start ballasts to operate efficiently well below the industry standard of 90°C. in modern applications. Such ballast progress allows maximum latitude in fixture design and styling.

Specify General Electric ballasts! They are engineered to back up your efforts toward modern, functional lighting—and *lighting progress*. As we see it, General Electric ballast progress is answering the needs of lighting progress. General Electric Co., Section 401-52, Schenectady, N. Y.



New G-E testing laboratory simulates ballast operating conditions in modern fixtures, assuring realistic heat measurements.

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LONG SPAN M-DECKS



In Long Span M-Deck Sections You get the Roof Structure, the Roof Deck, and Acoustical Ceiling — All in One Package. Troffer Lighting can be Included in Combined Roof-Ceiling.

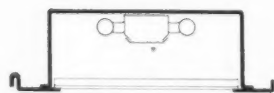
Mahon Long Span M-Deck in the Roof of the New Practice Session Field House, Ohio State University. Howard Dwight Smith, Architect, State of Ohio. Barber & Magee, Structural Engineers. Joseph Skilken & Co., General Contractors.

... Open the Way to New Concepts in both Structural Design and Function of a Modern Roof!

MAHON LONG SPAN M-DECK SECTIONS



PERFORATED AREAS
SECTION M2SR (Acoustical)



LIGHT DIFFUSER
SECTION M1T (Troffer)

MAHON LONG SPAN OPEN BEAM M-DECK



SECTION M1-OB

MAHON STEEL DECK



STANDARD DOUBLE RIB



WIDE-FLANGE DOUBLE RIB

In M-Decks the architect and structural designers are given a versatile building product that permits them to design a simple roof in which the structural supporting members, the roof deck, the finished ceiling material, and the acoustical treatment can all be contained in one light weight, quickly erected unit. In schools, auditoriums, armories, sports arenas, field houses, churches or any type of building where wall to wall bearing is possible, or where rigid frame or exposed truss construction is employed, Mahon Cellular Steel M-Decks provide the structural roof and the finished ceiling material combined. Many arrangements are possible and many ceiling effects are obtainable. The long span structural M-Deck Sections span from wall to wall or from truss to truss. This eliminates roof beams and the cluttered effect of roof purlins, and produces a neat, continuous beamed or flat metal ceiling surface which is virtually indestructible. If recessed lighting is desired, Mahon Troffer Sections can be included in this type of roof-ceiling construction in any ratio to meet lighting requirements. Exposed metal surfaces of both M-Deck and Troffer Sections, which form the ceiling, can be readily painted to harmonize with any interior decor. Mahon cellular M-Deck Sections can be furnished with bottom metal perforated and fitted to provide a highly effective acoustical ceiling . . . Noise Reduction Coefficients range up to .85 in ceilings constructed with Mahon Sections of this type. Have a Mahon sales engineer call and bring you up to date on new Mahon Long Span Structural Sections now available for Roof, and Combined Roof-Ceiling Construction, or write for Catalogue LSD-58.

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MAHON

CONSULTING ENGINEER



The Legal Aspect

MELVIN NORD, P.E.

Consultant in Legal and Technical Problems
Patent Attorney

Contractual Liability of Municipal Corporations

With regard to contracts, the legal liability of a municipal corporation is, in general, like that of a business corporation, rather than like an agency of the state. That is to say, it has no immunity from liability on its contracts.

Ultra Vires Contracts

However, there is one very important difference. A business corporation that enters into a contract which exceeds its corporate powers is not necessarily entering into a void contract. It is said to be *ultra vires* (beyond its power) rather than void. If an *ultra vires* contract of a business corporation has been fully performed on both sides, it is completely valid. If it is completely unperformed on both sides, it is completely unenforceable. In the in-between cases, the result depends on the situation and on the jurisdiction. However, in the case of municipal corporations, the result is easy to remember. An *ultra vires* contract of a municipal corporation is absolutely void. Neither party can enforce it. The reason this rule is so easy to remember is that failure to keep it in mind, resulting in a boner, is hard to forget.

If the contract is *ultra vires* and also against public policy, it will be regarded not only as void (in which event neither party can recover what it has given, or the reasonable value thereof), but as illegal. In this situation, the court leaves the parties exactly where it finds them. It gives neither party any relief, in either the affirmative or the negative direction. Neither party can enforce it, and neither party can recover what he has given or its reasonable value. This is the most common result of an *ultra vires* contract with a municipality, and it means that a consulting engineer who deals contractually with a municipality must be certain that the municipality stays within its powers. If he fails to do so, the results are likely to be disastrous.

An example that illustrates this particular problem is found in *Watson v. City of New Smyrna Beach*, 85 So. (2d) 584, a Florida case decided March 5, 1956.

Sweat was a member of the City Commission. He was also a partner with Wright in a firm engaged in the construction business.

At a meeting of the City commission, Sweat offered a motion that bids be invited for the alteration and extension of the City's power plant. The motion was unanimously carried, and the advertisements were made for public bids. Three bids were received, the lowest being from the partnership of Sweat & Wright. One of the City commissioners, however, challenged this bid because Sweat was a member of the commission. The City attorney's advice was asked, and he advised that the bid would have to be rejected because of a provision in the City Charter prohibiting self-dealing. The other two bids also were rejected, because they had not been accompanied by the required bond or certified check.

New bids then were invited. Among the new bids received, the lowest bid was rejected, because the bond had not been obtained from a local agent, as required. The next lowest bid was Wright, individually, rather than as a partnership with Sweat. The contract was let to Wright.

Contract Void

Watson, a taxpayer, objected to this, and brought a taxpayer's suit to have the contract declared void, as in violation of the self-dealing provision of the City Charter.

Despite the fact that Sweat was not personally involved in the bid, the court held that the contract was void, saying, "Honest as may have been the motives of all concerned, mischief could result from such a situation, if not in this case, certainly

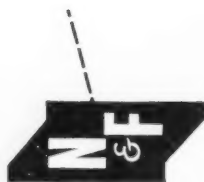
1. The characteristics of the material.
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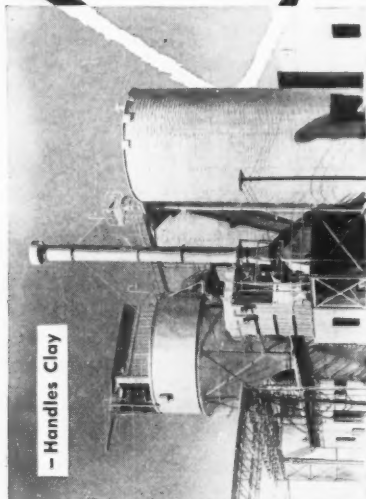
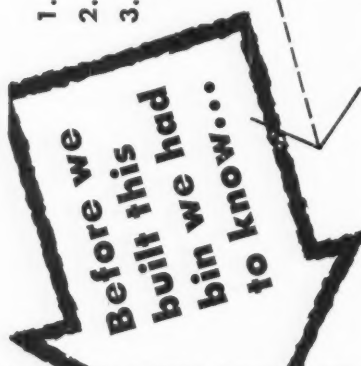
While we do not sell machinery, nor are we affiliated with any machinery manufacturers, we can be of great help to you in suggesting loading and unloading systems.

On your next storage bin, call us in on the early stages of planning. You will have a better bin.

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in cases to follow were it to become a precedent."

Covenants Void

Another example of an *ultra vires* contract is found in the case of *Spoerl v. Township of Pennsauken*, 14 N.J. 186, 101 Atl. (2d) 855, a New Jersey case decided January 11, 1954.

In 1941 the Township of Pennsauken conveyed the title of certain land to the Capital Development Corp. The title deeds contained covenants running with the land to subsequent owners, releasing them from liability from any future assessments for municipal sewerage facilities that might be constructed at a future date to serve the community.

The land later was subdivided and sold to a number of owners, who subsequently were assessed for new sewerage developments, contrary to the covenants mentioned above.

In a suit by these owners to enjoin these assessments, the defense of the municipality was that the granting of such exemptions was *ultra vires*, since they unfairly increased the tax burden on others not so favored. The owners argued that these assessments had been given for an adequate compensation included in the purchase price of the land. However, in view of the fact that the purchase price of the land was only about one-third the amount of the assessment, the court held otherwise, i. e. it held that these covenants were void. Thus, the owners were forced to pay the assessments.

Misrepresentation

If a municipality makes material misrepresentations in connection with a public works contract, it is subject to exactly the same consequences as if it were a private party.

Valentini v. City of Adrian, 79 N.W. (2d) 885, a Michigan case decided Dec. 28, 1956, involved an action by a sewer contractor against a municipality, for dam-

ages for excessive cost of constructing a sewer, caused by the City's alleged misrepresentations of subsoil conditions.

In 1950, the City solicited bids for the construction of a sewer. The plaintiff obtained from the City's consulting engineers a copy of the plans and specifications, and examined the job site, but did not make test borings or examine the subsoil conditions.

The City's plans and specifications contained the following provisions: "It is required that each bidder will examine the drawings and specifications for this work and make a personal examination of the site of the proposed work and its surroundings... Borings have been made and logs thereof are recorded in the drawings. This information is offered to the bidder merely as evidence, and the bidder himself must assume entire responsibility for any conclusions which he may draw from it."

Although the foreman of the public works department of the City knew that there was quicksand and excessive water conditions in the subsoil, the drawings did not show this.

Fraudulent Misrepresentation

The court upheld a verdict of \$115,741.15 for the plaintiff, on the ground that this was a fraudulent misrepresentation. It did not make any difference whether the plaintiff was unreasonable in relying on the plans and specifications, because this was an intentional deception. The rule of fraud is that if you intend to deceive someone, and succeed, you are liable for the damages even if the victim's reliance on your representation of the circumstances was not reasonable.

This case is actually on the borderline between tort and contract, as are all cases involving misrepresentations made in connection with a contract.

Next month we will discuss the question of the tort liability of a municipality. ▲▲

COLOR-PORT

water level gage

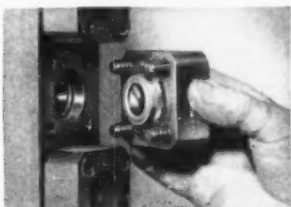
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 . . . low maintenance
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You get a *triple advantage* with the Yarway COLOR-PORT boiler water level gage for pressures to 3000 psi.

Two-color readings are brilliant and clear. Water shows green; steam shows red. A full gage is all green and an empty gage all red.

Low maintenance with individual cover-glass assemblies, each held solidly in place by four socket head cap screws. "Floating assembly" design applies safe, predetermined loads on glass ports, reducing thermal shocks, permitting faster warm-up.

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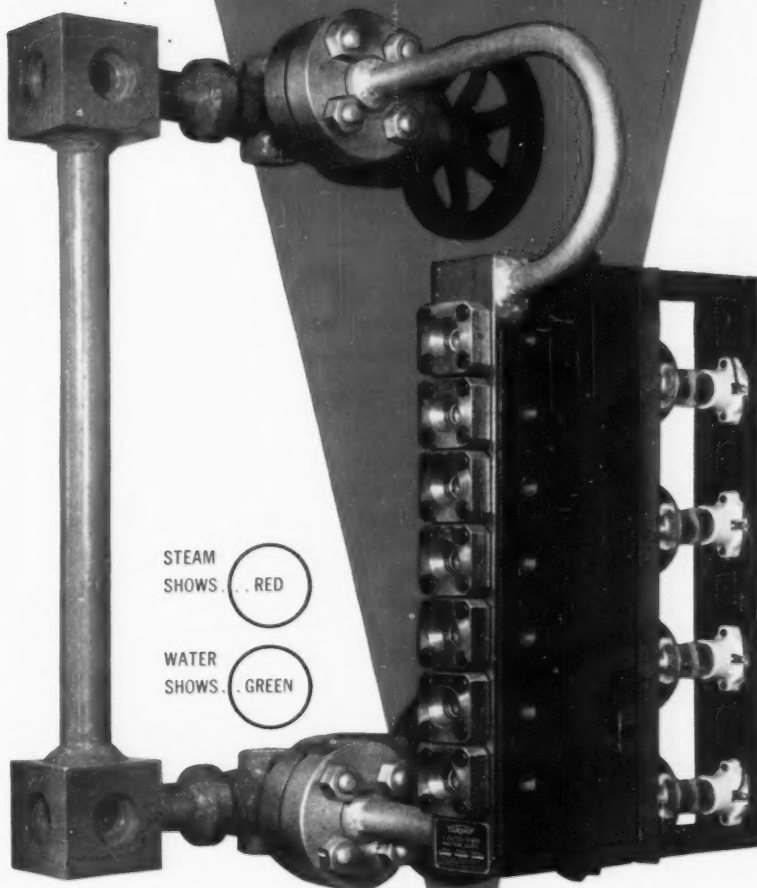
Yarway Bulletin WG-1814 describes the Color-Port Gage. Write for it.

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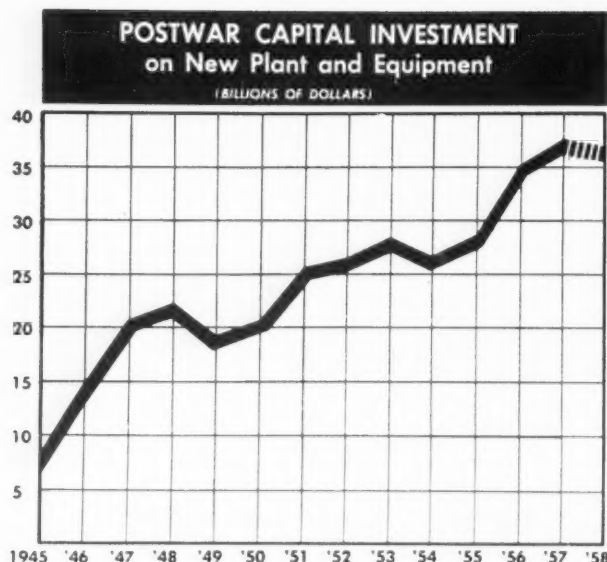
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1958 — A Good Year For the Engineer

WILLIAM G. DOOLY, JR.
Staff Member
The Associated General Contractors
of America, Inc.

C_E exclusive A COUPLE OF MONTHS AGO, economists who could be pinned down publicly and specifically on their ideas of business conditions during the upcoming year were rare creatures. Even at year's end, most statements were peppered with cautious assumptions. Forecasters searched for any trend that might help foretell the months ahead.

But the chips are down now—at least for the immediate future and we have to hear the unpalatable words “recession,” or “setback,” used to describe the national economy. The more exacting are prone to substitute such expressions as “a rolling readjustment,” or a “sidewise movement” in analyses of business prospects.

A business slowdown became easily discernible by the end of the year, and definite declines in some lines appear certain, at least in the first half of 1958.

Construction Will Be Up

How does construction fit into this picture?

If major forecasts are met, construction as a whole will prove to be a stabilizing giant in the adjustment of 1958, just as it did in the business setbacks of 1949 and 1954.

Perhaps the most important—and one of the most optimistic construction forecasts—is the official government estimate, made jointly by the Departments of Commerce and Labor. These economists say that outlays for new construction this year will reach \$49.6 billion. This would be 5 percent above the record-breaking volume of \$47.2 billion estimated for 1957, which saw dollar volume rise about 3 percent above the 1956 total.

The Associated General Contractors of America this month is estimating, somewhat more conserva-

tively, that 1958 dollar volume of new construction may hit \$49 billion, for an increase of some 4 percent over 1957.

More Stabilized Costs

Thus it appears, from the best information available, that new construction this year should increase by 4 to 5 percent in dollar volume. Added to this \$49 billion-plus should be an increasing maintenance and repair volume of \$18 to \$19 billion, bringing the total construction volume to perhaps \$68 billion, a record-breaker for the 13th consecutive year.

This should result in a larger physical volume, too, for more stabilized cost conditions are expected this year, in contrast to 1957.

We must assume that the economic slowdown now visualized will not be drastic enough to affect construction seriously, that international developments will have no direct effect on construction in the United States, that construction costs will tend to stabilize, that credit will be easier, and that materials and labor will be in adequate supply. Fortunately, these are not unreasonable assumptions.

Contract Awards Picture

An earlier outlook study by the F. W. Dodge Corporation, directed both at the contract awards picture and construction volume prospects, indicated pretty much the same trend, pointing to “mild improvement in the construction picture as a whole, with some variations in detail” during 1958.

The Dodge Corporation, whose 37-state reports of contract awards for years have been a key ingredient of both governmental and private construction forecasts, presented outlook estimates based on its new coverage of all of the 48 states. These indicated:

¶ Total building and engineering contract awards are expected to reach \$33.8 billion in 1958, an increase of 5 percent over 1957.

¶ Within this total, residential building contracts are expected to rise 8 percent; nonresidential building contracts, only 1 percent; and public works and utilities contracts by 7 percent.

The Dodge contracts forecast was made in November after polling 202 leading economists in October who cautiously expected, with considerable misgivings, a modest increase in 1958 business dollar volume and a construction volume running at about the same level as 1957.

Principal Points of Outlook

The optimistic tone of the government's outlook at a time when a business slowdown is evident is all the more singular because estimates of the Departments of Commerce and Labor have generally proved too conservative in the past.

Here are the principal points:

¶ The \$2.4 billion expansion will be nearly all in residential building and the awakening long-range highway program.

¶ Private expenditures, supported by a turnabout in residential activity, will rise by \$1.4 billion to \$34.7 billion, while public projects will increase by about \$1 billion to a total of \$14.9 billion in 1958.

¶ Of special interest to consulting engineers: Declining capital expenditures by business — a major cause of the mild recession in prospect — will bring about a moderate decrease in private industrial construction. But this will be more than offset by increases in all other major categories of nonresidential construction, including a reversal of the 1957 decline in the commercial area. In the public sector, the only notable decline is expected in military facilities, and this might well be reversed by a disturbed congress.

Business Construction

Reduced capital expenditure plans of all business, which are a major factor in dampening optimism for the economic outlook in 1958, will depress industrial building volume during the year. However, total plant and equipment expenditures are expected to slide only moderately from the all-time high of \$37.3 billion during 1957 to between \$35 billion and \$36 billion in 1958. Since roughly one-third of all capital outlay is spent on construction, this would indicate a total of some \$12 billion in business construction this year, but the Departments of Commerce and Labor see even more than that.

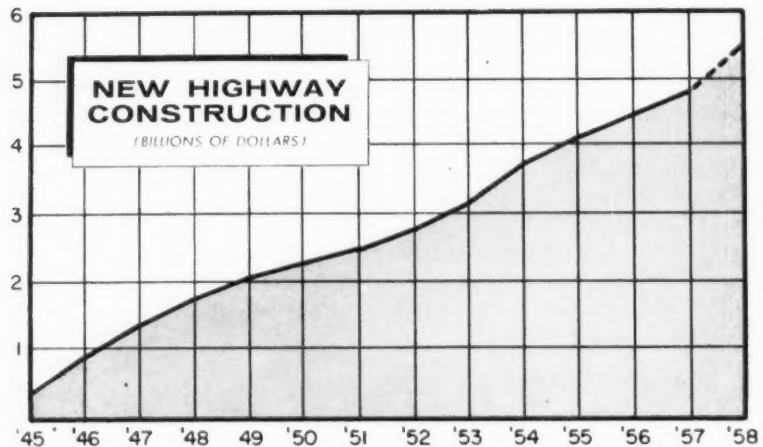
Suprisingly, commercial construction is slated for a 5 percent increase, following a slight decline in 1957. Another year of expansion in office buildings

NEW CONSTRUCTION VOLUME ESTIMATES¹
(Millions of Dollars)

	← Year →			% Change
	1956	1957 ²	1958	1957-58
New construction	\$46,060	\$47,200	\$49,600	+ 5
Private construction	33,242	33,300	34,700	+ 4
Residential building	17,632	16,530	17,575	+ 6
Nonresidential building	8,817	9,155	9,150	—
Industrial	3,084	3,170	2,875	- 9
Commercial	3,631	3,585	3,775	+ 5
Religious	768	870	870	—
Educational	536	525	540	+ 3
Hospital & institutional	328	505	590	+17
Social, recreational & misc.	470	500	500	—
Farm construction	1,560	1,600	1,600	—
Public utilities	5,113	5,825	6,150	+ 6
All other private	120	190	225	+18
Public construction	12,818	13,900	14,900	+ 7
Residential building	292	505	850	+68
Nonresidential building	4,072	4,470	4,710	+ 5
Industrial	453	455	450	- 1
Educational	2,549	2,830	3,000	+ 6
Hospital & institutional	298	330	340	+ 3
Administrative & service	362	430	470	+ 9
Other nonresidential	410	425	450	+ 6
Military facilities	1,395	1,275	1,100	-14
Highways	4,470	4,825	5,500	+ 8
Sewer and water	1,275	1,345	1,270	- 6
Public service enterprises	384	395	400	+ 1
Conservation & development	826	965	950	- 2
All other public	104	120	120	—

1. Joint estimates of the Departments of Commerce and Labor.
2. Last two months estimated.

HIGHWAY CONSTRUCTION EXPENDITURES WILL INCREASE SHARPLY IN 1958, STIMULATED MAINLY BY THE 41,000-MILE INTERSTATE SYSTEM.



and warehouses to meet demands for modern structures in more desirable locations is expected to push this category past the \$2 billion mark, which, with \$1.8 billion in stores, restaurants and garages, make up the commercial area.

Commercial and Utility

The government's outlook of \$1.8 billion for the retail sector of commercial activity — about the same level as 1957 — may be a little shaky in view of the completion last year of many large regional and community shopping centers started in previous years — and the uncertainty that retail sales will remain at very high levels in 1958. But any decline probably would be slight, and brief, because of the mushrooming population and continued movement to the suburbs.

The main strength of the business construction field again will come from privately-owned public utilities, whose anticipated \$6 billion outlay in 1958 would again break records in this category. Electric power and gas facilities will dominate this field both in amount of increase — over 10 percent each — and in volume, at \$2.4 billion and \$2 billion, respectively. Moderate declines are indicated for railroad and telephone expenditures.

Apartment Activity Increasing

Among the minor private nonresidential building categories, hospital and institutional construction, which jumped more than 50 percent last year, is expected to increase again to nearly \$600 million this year, partly as the result of Federal-aid stimulation.

Church building should at least maintain its boom-sized peak of \$870 million reached in 1957, and private school construction is expected to increase slightly to \$540 million.

Residential construction, after a sharp decline in 1957, is looked to by economists to supply a hefty boost to the economy this year, sparked by loosening credit, more public housing, and other factors.

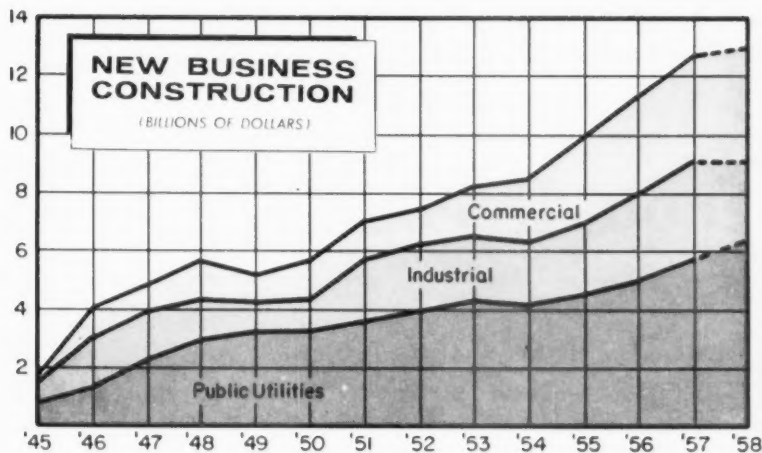
Of interest to consulting engineers is the Commerce-Labor prediction of a substantial increase in apartment construction. "It is likely that apartment units will constitute almost a fifth of total housing starts (1,000,000 plus) in 1958 — the largest proportion since 1949, when apartment house construction was assisted by easy credit conditions and by special financing aids under the former Section 608 program of the National Housing Act," the agencies state. This unusual increase is attributed to rebuilding programs for urban centers, expectation of better returns on rental investments, and substantial demand for central locations for the increasing numbers of elderly persons and young couples without children.

Highways Dominate Public Field

Most of the 7 percent increase looked for in public construction will be in the state and local public works categories which have increasingly dominated the public sector of activity during the past few years, and should account for three-quarters of the 1958 public total.

The giant among these is highways and streets, which this year should show the first big spurt under the long-range construction program stimulus with a 14 percent increase to about \$5.5 billion of work put in place. Nearly all of this increase is slated on the 41,000-mile Interstate System for which the Federal government pays 90 percent, with total outlays expected to increase from \$250 million in 1957 to \$850 million this year for actual construction completed.

Much hue and cry has been made in several quarters about the "lagging" Interstate highway program, which some apparently thought could be put in high gear overnight. Some states have lagged behind others in getting construction started because of such factors as initial concentration on planning, financial and statutory problems, and difficulties in acquiring right-of-way. However, experienced Fed-



WHILE INDUSTRIAL CONSTRUCTION WILL HOLD STEADY, PUBLIC UTILITY AND COMMERCIAL BUILDING WILL CONTINUE TO MOVE UP DURING 1958.

eral and state highway engineers and contractors who looked realistically at the amount of planning required feel that over-all progress has been steady and that the program really will get going in 1958.

These important statistics were noted by the end of the year:

• Some \$3.3 billion, covering more than 4000 miles, had been programmed by states for work on the Interstate System since passage of the 1956 Federal-Aid Highway Act.

• More than \$1 billion in preliminary engineering and right-of-way acquisition had been authorized. Planning for more than 1300 miles of interstate highways is in the advanced stage, and the mounting backlog of projects on which many preliminaries have been completed will be translated into a large volume of work under way.

A re-estimate of costs, due to go to Congress this month, may force a stretching out of the program beyond the 15- to 16-year funding period. The regular, continuing Federal-aid highway program (50-50 matching basis, generally) also will increase as states shift more funds from their independent projects to those that receive government help. County and municipal road and street construction will continue upward.

Other Public Works

The rise in public school construction is expected to continue indefinitely under the impetus of population increases and under-building during and before World War II. It should pass \$3 billion in 1958.

A slight decline in the other major state and local category — sewerage and water facilities — is anticipated by the government, partly as the result of the residential building decline of last year. Modest increases are expected in minor categories such as administrative and service buildings and hospitals.

While a number of localities have experienced difficulties in marketing bonds because of rising interest rates, signs of easing rates were noted in

December following the Federal Reserve Board's change in the discount rate. A healthy percentage of bond issues for public works continues to be voted by localities, and a definite easing in the credit situation could bring a rosier picture in the state and local construction field.

The unpredictable military construction category is expected to decline 14 percent to just over \$1 billion this year, according to present plans, while the rest of the public types — industrial, public service enterprises, and conservation — are expected to hold near 1957 levels.

New starts are few for the Corps of Engineers, but projects under way will make peak progress, and the Bureau of Reclamation will spend heavily on the early stages of the Glen Canyon dam and Trinity River diversion projects, while activity will continue to decline on the St. Lawrence Seaway.

Conclusion

In summary, these points seem clear in the outlook at this date:

• Most economists agree that either a mild recession, or just a "sidewise movement" — not a severe depression — is in the offing.

• Construction should have another year of high, though not greatly expanding dollar volume, sparked by a recovery in residential activity and an expansion in highway building. Costs should rise at a slower rate.

• Business construction will continue at a high level, supported by commercial and public utility work, but industrial building will be depressed by a declining rate of capital expenditures — which still will be high by pre-1956 standards.

• The highway program, now getting off the ground, will be a big factor in the construction industry for many years, stimulating other construction, particularly industrial building.

• Consulting engineers, in other words, should look forward to another good year. ▲▲



How Well Are You Recognized?

A Staff Report Based on a Survey of the Profession

WHEN A MAN IS SICK he knows that he needs a doctor. If he finds himself in jail or being sued, he calls a lawyer. But the average man seldom needs a consulting engineer, and when he does, it is unlikely that he knows it. This places the consulting engineer in a professional predicament. The other professions have labeled advertising as unethical (perhaps partially because they have no need for it), and engineers in private practice have gone along with them even though conditions of operation are different.

Not only does the general public have little idea of what a consulting engineer is or what he does, but in order to make a living, the engineer must secure his work from a much greater geographical area. Most doctors and lawyers—and even architects—confine their practices to their own immediate communities. Consulting engineers, on the other hand, work for clients in distant states and foreign countries. It is easy to be known by your neighbors and have your professional proficiency passed along locally by word of mouth, but it is not so easy to have your reputation spread verbally from Bangor to Brooklyn to Bangkok.

This survey was made to find out what consulting engineers think about the recognition of their profession. Would it help if the profession were better recognized? Or is the private practice of engineering an occupation like ghost writing that thrives on anonymity? What is being done now to increase the understanding of the profession, and who is doing it?

These are questions to which the profession needs accurate answers.

Despite the post-Sputnik spurt of interest in science, engineering remains a nebulous profession. All of the recent publicity may have explained to the public the role of those engineers working on the missile projects or in the electronic laboratories, but it has done little to furnish information concerning the functions of the consulting engineer.

If they ever want to knock another Nadler off the \$64,000 Challenge, all they need to do is to ask him, "What is a consulting engineer?" and "Name

the consulting engineers who designed any three of the "Ten Engineering Wonders of the Modern World?"

He wouldn't have a chance.

Public Understanding

Of the 2000 survey returns analyzed for this report, only two consulting engineers in the whole country thought the general public understood excellently the function of the consulting engineer. One of these two is located in Massachusetts and the other is in California, so this minuscule minority has a fine geographical spread if little numerical weight. We are inclined to attribute these two answers to slips of the pencil rather than slips of the mind.

We can eliminate any possibility of the public having an excellent understanding of the functions of the consulting engineer. That leaves three other possibilities—Fairly Well, Poorly, or Not at All. For the U. S. as a whole, 11 percent of those answering the questionnaire felt that the public understood the consulting engineer's function Fairly Well. Another 62 percent rated public understanding as Poor, while 23 percent said the public knew the consulting engineer Not at All. To this must be added the inevitable Don't Know group, which

1 — How well does the general public understand the function of the consulting engineer?

Section	Excellent %	Fairly Well %	Poorly %	Not At All %	Don't Know %
South	0	11	65	21	3
Midwest	0	13	62	22	3
Southwest	0	10	70	20	0
East	0	11	59	25	5
West	0	11	62	22	5
Total U.S.	0	11	62	23	4

1A—Who is doing the best job of telling the general public about the functions of the consulting engineer?

State	Individual Firms		Professional Societies		Technical Societies		Cons. Engr. Associations		Others		Don't Know
	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Total %
Ala.	43	25	17	21	7	19	13	22	7	13	13
Ark.	40	23	20	25	10	18	10	14	10	20	10
Fla.	52	29	23	24	5	18	3	18	8	11	9
Ga. ²	32	26	34	26	4	17	12	20	8	11	10
Ky. ¹	53	28	7	21	7	16	13	22	20	13	0
La. ^{1,2}	62	30	2	16	4	19	9	20	13	15	10
Miss.	31	31	45	24	0	18	9	19	0	8	15
Mo. ²	39	25	27	23	8	20	11	20	8	12	7
N.C.	59	28	25	26	0	16	6	18	6	12	4
S.C.	—	—	—	—	—	—	—	—	—	—	—
Tenn.	—	—	—	—	—	—	—	—	—	—	—
Va.	30	27	40	26	0	16	0	17	17	14	13
W. Va.	33	25	44	25	0	21	11	18	11	11	1
SOUTH	45	27	25	23	5	18	8	19	9	13	8
Ill. ²	45	28	11	21	8	18	15	20	11	13	10
Ind.	39	26	36	26	0	19	13	17	6	12	6
Iowa ²	60	30	12	23	4	16	16	21	8	10	0
Kans.	39	28	35	27	4	17	0	18	8	10	14
Mich.	35	26	31	24	3	18	7	19	7	13	17
Minn. ²	53	29	15	19	2	15	18	23	4	14	8
Ohio	33	26	38	26	7	19	9	19	8	10	5
Wis.	32	24	39	27	0	18	18	20	11	11	0
MIDWEST	46	27	24	23	5	17	12	20	8	13	5
Ariz.	56	27	38	28	0	18	6	16	0	11	0
N.M. ²	47	27	18	22	6	18	6	22	12	11	11
Nev.	—	—	—	—	—	—	—	—	—	—	—
Okla. ²	30	24	20	23	0	17	40	27	0	9	10
Texas ³	44	28	41	27	5	19	0	16	3	10	7
SOUTHWEST	46	28	35	26	4	19	6	18	4	9	5
Conn.	38	26	22	23	5	19	11	18	11	14	13
Del.	—	—	—	—	—	—	—	—	—	—	—
D.C.	36	26	24	25	4	17	4	16	12	16	20
Me. ¹	—	—	—	—	—	—	—	—	—	—	—
Md.	34	23	20	21	10	16	15	12	14	28	7
Mass.	36	25	30	24	9	22	5	18	6	11	14
N.H. ¹	—	—	—	—	—	—	—	—	—	—	—
N.J.	39	27	26	25	12	20	4	16	12	12	7
N.Y. ²	39	26	21	23	6	18	6	19	12	14	16
Pa.	35	25	30	24	13	20	18	21	2	10	2
R.I.	—	—	—	—	—	—	—	—	—	—	—
Vt. ¹	—	—	—	—	—	—	—	—	—	—	—
EAST	38	26	24	23	8	19	8	18	11	14	11
Calif. ²	42	28	14	21	9	16	17	23	6	12	12
Colo. ²	37	25	29	25	3	17	16	22	11	11	4
Idaho	57	29	29	25	7	18	7	20	0	8	0
Mont.	—	—	—	—	—	—	—	—	—	—	—
Nebr.	47	26	40	27	0	20	0	17	0	10	13
N.D. ²	56	29	0	18	0	16	44	25	0	12	0
Ore. ^{1,2}	54	28	4	17	11	18	21	24	7	13	3
S.D.	—	—	—	—	—	—	—	—	—	9	—
Utah ²	41	27	12	21	0	16	11	23	18	13	18
Wash. ²	31	27	31	30	8	15	15	21	0	7	15
Wyo.	—	—	—	—	—	—	—	—	—	—	—
WEST	43	28	17	22	7	16	17	22	6	12	10
U. S. TOTAL	42	27	23	23	6	18	10	20	9	12	10

Where no figures are shown for a state, returns were too few to be statistically indicative. The column headed Weighted Rating takes into consideration not only the 1st place ranking but also the number of 2nd, 3rd, 4th, and 5th place positions given each group.

1. States in which there are no state societies of professional engineers affiliated with NSPE.

2. States in which there are associations of consulting engineers affiliated with the Consulting Engineers Council.

3. Texas has CEC affiliated association only in Dallas-Fort Worth area.

1B — If the general public understood the function of the consulting engineer as well as it understands the functions of the medical doctor or lawyer, would that increase the amount of work going to consulting engineers?

Section	Greatly %	Some %	Slightly %	None %	Don't Know %
South	51	37	7	2	3
Midwest	47	34	14	2	3
Southwest	43	38	15	2	2
East	39	40	14	4	3
West	50	38	8	2	2
Total U.S.	46	38	11	3	2

came to about 4 percent of the survey respondents.

We can say, then, that a majority of the engineers in private practice feel that the general public understands them poorly or not at all.

An examination of the tabular data relating to this question will show that there is little variation in answers from section to section in the country. The consulting engineers of the Southwest seem to be more inclined to compromise on "Poorly" and give less weight to the two extremes, but even that area is not much out of line with the national percentage figures.

Who is Telling the Public

The next question asked who is currently doing the most to inform the public of the function of the consulting engineer. Since it is clear that not much is being accomplished, the winners here have little to brag about. The best they can claim is that they are doing the most — where nearly nothing is being done. This meager measure of credit goes to individual firms of consulting engineers.

Table 1A shows, for example, that 42 percent of the respondents rated individual consulting firms as doing the best job of informing the general public of the role of the consulting engineer. The profes-

2 — Does the private client group (industrialists, utility executives, real estate investors, etc.) understand the function of the consulting engineer?

Section	Excellently %	Fairly Well %	Poorly %	Not At All %	Don't Know %
South	6	63	26	3	2
Midwest	7	62	26	3	2
Southwest	7	71	17	4	1
East	7	61	25	5	2
West	5	63	26	5	1
Total U.S.	6	63	25	4	2

sional societies (NSPE and the various state societies) came in second, being rated as most important by 23 percent. Consulting engineer associations ranked third, having been put at the top by 10 percent; "others" came in fourth with 9 percent; while technical societies were considered the most important public relations influence by the lowest number (6 percent). The remaining 10 percent are shown in the table under the heading "Don't Know."

Weighted Ratings

It is important to remember that these figures show the percentage of the respondents who rated a group in first place — as the *most* important influence in informing the public of the role of the consulting engineer. A clearer picture can be had by examining the weighted rating figures. These weighted ratings were calculated by the same system used to determine the Top Ten Football Teams. Five points were given for each first place ranking, four for each second, down to one point for last place. This gave a weighted total which was then translated into the equivalent of a percentage figure. Because these weighted ratings, shown in red in the tables, take into consideration the number of second, third, fourth, and fifth place rankings, they present a much truer picture than do the black, first place percentage figures.

The need for weighting is obvious. Suppose that in one state Individual Firms were put in first place by 50 replies, in second place by 5; third place by 5; fourth place by 5; and last place by 35. If, in comparison, Professional Societies had a score of 48, 37, 5, 5, and 5 the first place percentages alone, would put Individual Firms ahead of Professional Societies 50 to 48. But this obviously is not a true picture. A weighted rating would show Individual Firms 44 and Professional Societies 56 — a much better representation in view of the large number of replies that put Professional Societies in second place. This example illustrates the importance of weighting.

It should be noted that the weighted ratings for the U. S. as a whole only change the actual order of two groups. The results show Individual Firms 27, Professional Societies 23, Consulting Engineer Associations 20, Technical Societies 18, and Other 12. Technical Societies, when weighted, move up from a poor 6 to a fairly respectable 18. This means that while only 6 percent ranked them first in advancing the consulting engineer's public relations, a large number of answers put them second and third, thereby bringing up their weighted rating.

It is something of a surprise to find that the Consulting Engineering Societies are given so high a rating. There are only 17 states that have such associations over a year old. Not only are they few in number, but only two or three of them have yet undertaken any kind of public relations program.

It would seem that NSPE, with its National En-

2A—Who is doing the best job of telling the private client group* about the functions of the consulting engineer?

State	Individual Firms		Professional Societies		Technical Societies		Cons. Engr. Associations		Others		Don't Know
	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	
Ala.	53	28	7	21	10	19	10	20	7	12	13
Ark.	50	31	0	20	0	14	10	15	30	20	10
Fla.	75	34	11	22	3	16	0	17	5	11	6
Ga. ²	72	30	10	26	0	15	4	18	8	11	6
Ky. ¹	67	32	13	19	7	18	7	20	6	11	0
La. ^{1, 2}	76	32	0	16	4	19	9	20	7	13	4
Miss.	82	35	0	23	0	17	9	15	9	10	0
Mo. ²	60	30	20	22	7	19	4	18	5	11	4
N.C.	75	33	9	23	3	16	3	15	6	13	4
S.C.	—	—	—	—	—	—	—	—	—	—	—
Tenn.	—	—	—	—	—	—	—	—	—	—	—
Va.	63	32	20	25	0	15	0	17	10	11	7
W. Va.	44	26	11	22	11	20	11	17	22	15	1
SOUTH	68	32	11	22	4	17	4	18	7	11	6
Ill. ²	71	32	7	19	3	17	7	19	6	13	6
Ind.	64	31	23	24	0	18	7	15	6	12	0
Iowa ²	76	32	4	20	0	16	8	19	12	13	0
Kans.	69	34	15	23	0	16	0	18	4	9	12
Mich.	66	32	5	21	7	18	7	19	3	10	12
Minn. ²	69	31	7	18	3	16	11	22	4	13	6
Ohio	74	33	15	22	2	18	3	18	3	9	3
Wis.	78	32	11	22	4	17	7	19	0	10	0
MIDWEST†	74	32	10	20	3	17	6	19	5	12	5
Ariz.	75	32	19	26	0	16	6	17	0	9	0
N.M. ²	53	30	12	20	12	19	0	16	23	15	0
Nev.	—	—	—	—	—	—	—	—	—	—	—
Okla. ²	50	30	30	23	0	14	20	23	0	10	0
Texas ³	71	32	15	24	3	18	3	16	5	10	3
SOUTHWEST	66	32	17	23	4	17	5	17	7	11	1
Conn.	60	33	8	22	5	18	5	18	14	9	8
Del.	—	—	—	—	—	—	—	—	—	—	—
D.C.	68	31	8	21	8	21	4	16	4	11	8
Me. ¹	—	—	—	—	—	—	—	—	—	—	—
Md.	68	33	10	23	2	17	2	15	10	12	8
Mass.	73	33	7	20	5	21	0	15	4	10	11
N.H. ¹	—	—	—	—	—	—	—	—	—	—	—
N.J.	61	30	17	23	7	20	4	17	3	10	8
N.Y. ²	72	33	8	20	3	17	6	19	5	11	6
Pa.	60	29	18	21	5	20	13	20	3	10	1
R.I.	—	—	—	—	—	—	—	—	—	—	—
Vt. ¹	—	—	—	—	—	—	—	—	—	—	—
EAST	68	32	10	20	4	18	5	18	5	12	8
Calif. ²	69	32	6	18	5	18	9	21	4	11	7
Colo. ²	66	32	16	22	0	16	13	21	0	9	5
Idaho	57	28	14	25	14	18	14	22	0	7	1
Mont.	—	—	—	—	—	—	—	—	—	—	—
Nebr.	47	27	20	24	7	21	7	16	0	12	19
N.D. ²	89	34	11	19	0	12	0	23	0	12	0
Ore. ^{1, 2}	75	33	0	13	4	15	11	25	7	14	3
S.D.	—	—	—	—	—	—	—	—	—	—	—
Utah ²	41	28	12	19	0	13	18	21	12	19	17
Wash. ²	69	32	8	27	8	16	8	18	0	7	7
Wyo.	—	—	—	—	—	—	—	—	—	—	—
WEST	67	32	8	19	5	17	10	21	4	11	6
U.S. TOTAL	70	31	10	21	4	18	6	19	5	11	5

Where no figures are shown for a state, returns were too few to be statistically indicative. The column headed Weighted Rating takes into consideration not only the 1st place ranking but also the number of 2nd, 3rd, 4th, and 5th place positions given each group.

1. States in which there are no state societies of professional engineers affiliated with NSPE.

2. States in which there are associations of consulting engineers affiliated with the Consulting Engineers Council.

3. Texas has CEC affiliated association only in Dallas-Fort Worth area.

*Private client group includes industrialists, utility executives, real estate investors, etc.

2B — In 1958, I expect the private client groups to engage consulting engineers on a () percentage of their work than in 1957.

Section	Greater %	Same %	Less %	Don't Know %
South	22	56	9	13
Midwest	18	58	14	10
Southwest	22	59	11	8
East	17	54	15	14
West	22	58	9	11
Total U.S.	19	57	12	12

gineers' Week, and the Founder Societies with their public relations firms would have rated higher, but it must be remembered that these organizations have only a small percentage of their members in private practice and their public relations efforts are aimed at telling the public about engineers in general rather than consulting engineers in particular.

It is most interesting to notice the special situations in certain states. There are no state societies affiliated with the National Society of Professional Engineers in a few states. These states are indicated by a small "1" beside the state name in the tables. Without a single exception all of these states show a much smaller than average number of returns giving first place to Professional Societies. This would seem logical. Where there is no state professional society, little credit would be given them for public relations work.

This also works in reverse. It is well known that Ohio, Wisconsin, and Texas are among those states with strong, healthy State Societies of Professional Engineers. As might be expected, replies from these states gave an unusually large number of first place rankings to Professional Societies for their public relations work.

Contrast this with the states in which there is

an established association of consulting engineers affiliated with the Consulting Engineers Council. (These states are designated by a small "2"). In almost every instance these states rate Consulting Engineer Associations in first place more often than do other states in the area. In states where the percentage of the engineers belonging to these associations is high (Oklahoma and North Dakota, for example) first place ratings are extremely high, while in New York, where relatively few consulting engineers belong to the Associations, the influence is not noticeable. Some of these first place ratings could result from the desire of the respondents to put their favorite group at the top whether they deserved to be there or not. The weighted ratings largely compensate for this tendency and give a more accurate representation of the truth.

Who are the Others?

It will be seen that there is a sizeable group of respondents who ranked Others as foremost in informing the public about the consulting engineer. Who are the Others? Unfortunately, these turn out to be, in most instances, "no one." These answers ranked "no one" ahead of all the other groups.

Partially balancing this disenchanted attitude are the few who gave top credit to newspapers and magazines (there have been national advertisements showing dignified engineers, presumably consulting engineers, smoking particular brands of cigarettes or wearing certain cutters' suits or shirts). Several top rank ratings went to satisfied clients, manufacturers, and civic clubs — and this magazine itself got a handful of votes despite the fact that it does not go to the general public. With possibly more logic, one reply gave Krushchev first place.

Perhaps it does not really matter that so poor a job is being done. It is hard to inform the general public on anything. To tell the public about what the consulting engineer is and what he does may not be worth the time it would take nor the money it would cost.

To find out what consulting engineers think about this, the survey asked, "If the general public understood the function of the consulting engineer as well as it understands the functions of the medical doctor or the lawyer, would that increase the amount of work going to consulting engineers . . . greatly, some, slightly, or none?"

The answers, by sections of the country, are shown in Table 1B. While there is considerable variation in opinion from section to section, it is clear that in every section between 40 and 50 percent of the consulting engineers answering this survey thought the amount of work would be greatly increased if the general public understood the function of the consulting engineer as well as it does the function of the medical doctor or lawyer. For the U.S. as a whole, actual figures show 46 percent of the an-

3 — Does the public client groups (Federal, State, County, and City officials, school boards, etc.) understand the functions of the consulting engineer?

Section	Excellently %	Fairly Well %	Poorly %	Not At All %	Don't Know %
South	13	58	24	3	2
Midwest	10	62	19	4	5
Southwest	7	66	19	3	5
East	15	57	19	5	4
West	15	54	23	5	3
Total U.S.	13	58	21	4	4

3A—Who is doing the best job of telling the public client group* about the functions of the consulting engineer?

State	Individual Firms		Professional Societies		Technical Societies		Cons. Engr. Associations		Others		Don't Know
	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	
Ala.	40	26	13	22	10	19	13	21	7	12	17
Ark.	40	30	10	27	10	15	10	14	10	14	20
Fla.	66	31	20	24	3	17	1	18	2	10	8
Ga. ²	70	32	10	23	2	16	6	18	6	11	6
Ky. ¹	73	33	13	21	7	17	7	19	0	10	0
La. ^{1 2}	73	32	0	16	7	19	7	20	11	13	2
Miss.	82	35	0	24	9	20	9	15	0	6	0
Mo. ²	55	30	24	23	7	20	5	18	1	9	8
N.C.	69	32	19	25	3	16	0	15	6	12	3
S.C.	—	—	—	—	—	—	—	—	—	—	—
Tenn.	—	—	—	—	—	—	—	—	—	—	—
Va.	53	31	27	25	0	16	0	17	7	11	13
W. Va.	44	28	33	27	0	17	0	14	22	14	1
SOUTH	62	31	16	23	5	17	4	18	5	11	8
Ill. ²	62	31	7	20	7	18	9	20	5	11	10
Ind.	48	29	36	27	3	18	3	15	7	11	3
Iowa ²	72	33	12	22	4	15	4	20	8	10	0
Kans.	80	35	8	23	0	15	8	18	4	9	0
Mich.	67	31	14	23	5	18	3	17	5	11	16
Minn. ²	58	30	8	19	1	15	8	23	7	13	18
Ohio	58	31	19	22	3	16	6	17	8	12	6
Wis.	68	30	14	21	0	18	7	18	7	13	4
MIDWEST	61	31	14	22	4	17	7	19	6	11	8
Ariz.	63	30	31	28	0	16	6	17	0	9	0
N.M. ²	59	31	6	18	0	15	6	16	24	20	5
Nev.	—	—	—	—	—	—	—	—	—	—	—
Okla. ²	30	27	20	22	0	17	20	24	0	10	30
Texas ³	59	30	23	25	3	18	3	17	0	10	12
SOUTHWEST	57	30	21	24	2	18	6	17	4	11	10
Conn.	43	28	22	25	11	18	3	17	8	12	13
Del.	—	—	—	—	—	—	—	—	—	—	—
D.C.	68	31	20	22	4	19	0	16	0	12	8
Me. ¹	—	—	—	—	—	—	—	—	—	—	—
Md.	73	35	17	22	2	19	0	14	2	10	6
Mass.	53	30	14	21	7	21	5	17	4	11	17
N.H. ¹	—	—	—	—	—	—	—	—	—	—	—
N.J.	57	31	20	24	6	15	6	19	1	11	10
N.Y. ²	57	30	16	22	3	17	7	20	3	11	14
Pa.	49	29	29	24	2	17	11	20	2	10	7
R.I.	—	—	—	—	—	—	—	—	—	—	—
Vt. ¹	—	—	—	—	—	—	—	—	—	—	—
EAST	56	30	18	23	4	18	6	18	3	11	13
Calif. ²	55	29	8	19	9	19	14	22	5	11	9
Colo. ²	68	32	8	22	0	15	18	22	0	9	6
Idaho	64	30	14	24	0	16	14	23	0	7	8
Mont.	—	—	—	—	—	—	—	—	—	—	—
Nebr.	60	30	13	23	7	22	7	16	0	9	13
N.D. ²	89	35	0	18	0	12	11	25	0	10	0
Ore. ^{1 2}	61	33	4	17	7	17	14	22	4	11	10
S.D.	—	—	—	—	—	—	—	—	—	—	—
Utah ²	59	31	0	21	0	13	18	22	12	13	11
Wash. ²	69	33	8	24	15	16	8	19	0	8	0
Wyo.	—	—	—	—	—	—	—	—	—	—	—
WEST	60	30	7	20	7	18	14	22	4	10	8
U.S. TOTAL	59	31	15	22	5	18	7	19	5	10	9

Where no figures are shown for a state, returns were too few to be statistically indicative. The column headed Weighted Rating takes into consideration not only the 1st place ranking but also the number of 2nd, 3rd, 4th, and 5th place positions given each group.

1. States in which there are no state societies of professional engineers affiliated with NSPE.

2. States in which there are associations of consulting engineers affiliated with the Consulting Engineers Council.

3. Texas has CEC affiliated association only in Dallas-Fort Worth area.

*Public client group includes federal, state, county, and city officials, school boards, etc.

3B — In 1958, I expect the public client groups to engage consulting engineers on a () percentage of their work than in 1957.

Section	Greater %	Same %	Less %	Don't Know %
South	28	55	6	11
Midwest	28	56	5	11
Southwest	32	52	7	9
East	24	55	5	16
West	21	59	7	13
Total U.S.	26	56	6	12

swers indicated that work for the consultant would increase greatly, 38 percent indicated some increase would result, 11 thought there would be a slight increase, and 3 percent thought there would be no effect. The other 2 percent did not know.

If we combine the percentage who think better understanding by the public would increase the work going to consulting engineers greatly with those who feel it would be of some help, we get a grand total of 84 percent. These are the men whom one would think would be willing to spend some time and money to inform the public. In fact, they probably are willing, but so far no one has come up with a good sensible program of public relations. Telling the general public is no small order. First, you must interest them—yet few consulting engineers have the batting average of either Ted Williams or Porfirio Rubirosa.

The Client Groups

While it would be pleasant to have the recognition and understanding of the general public, it may be more to the immediate advantage of consulting engineers to be known to the specific groups who are potential clients—the private client group, the public client group, and architects.

4 — Do architects, as a client group, understand the function of the consulting engineer?

Section	Excellently %	Fairly Well %	Poorly %	Not All %	Don't Know %
South	29	58	9	1	3
Midwest	31	51	13	1	4
Southwest	29	50	6	5	10
East	30	52	10	1	7
West	33	49	10	1	7
Total U.S.	31	52	10	1	6

The private client group is composed of industrialists, who engage consulting engineers when they are putting up new plants, modernizing old plants, or adding to their plant facilities. This group also includes the utilities, who build new power plants and substations; and the real estate investors, who finance new monumental buildings, shopping centers, and residential subdivisions. This group should understand the function of the consulting engineer fully. If they do not, they can be expected to use contractors, manufacturers' engineers, or their own engineering staffs for work that could be done more efficiently and better by engineers in private practice. They cannot be expected to engage someone for services they do not understand.

For this reason, the answers to survey question 2 are of considerable importance.

The survey showed that in the United States as a whole only 6 percent think this private client group understands the consulting engineer's function Excellently. However, a big 63 percent feels the private client group understands Fairly Well; 25 percent say Poorly; and 4 percent say Not at All. While this is a very poor showing for Excellently, it is balanced to some extent by the large Fairly Well group. At least this special group of clients and prospective clients know a lot more about consulting engineers than the general public—as well they should! There are still one-quarter of the consulting engineers in this country who think this client group poorly understands the consulting engineer. If these consultants are right (and there are many more of them than there are those who think the consulting engineer is understood excellently) then there is a lot of business going astray that should be in engineering offices. If the majority are right in saying that the private client group understands the functions of the consulting engineer fairly well, there is still plenty of room for improvement and a lot of new business to be had.

Certainly, someone should be educating the private client group.

Once more it seems to be the individual efforts of the separate consulting engineer firms that most respondents credit with the best job. In fact, Individual Firms get many more first place rankings for their public relations efforts toward this private client group than they got for their efforts toward the general public. That seems logical. A consulting firm would naturally be more interested in educating potential clients than in enlightening the public at large.

Individual Firms got first place rating by 70 percent of those answering the questionnaire. Professional Societies were put first by 10 percent; Technical Societies by 4 percent; Consulting Engineer Associations by 6 percent; Others by 5 percent; and 5 percent Don't Know. These figures are for the U.S. as a whole, but they do not change much when

4A—Who is doing the best job of telling the architects about the functions of the consulting engineer?

State	Individual Firms		Professional Societies		Technical Societies		Cons. Engr. Associations		Others		Don't Know
	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	Rank 1st %	Weighted Rating	
Ala.	57	29	3	22	13	19	2	19	0	11	25
Ark.	40	28	40	30	0	17	10	16	0	9	10
Fla.	72	33	16	22	2	18	1	18	2	9	7
Ga. ²	63	31	18	24	2	17	2	18	2	10	12
Ky. ¹	87	34	0	21	0	17	13	20	0	8	0
La. ^{1, 2}	85	35	4	17	2	17	2	18	7	13	0
Miss.	73	38	9	22	0	17	0	12	9	11	9
Mo. ²	67	33	9	21	0	16	8	20	4	10	12
N.C.	78	34	16	26	0	15	0	16	0	9	6
S.C.	—	—	—	—	—	—	—	—	—	—	—
Tenn.	—	—	—	—	—	—	—	—	—	—	—
Va.	77	34	10	24	0	16	0	16	0	10	13
W. Va.	56	29	11	21	0	17	11	20	22	13	0
SOUTH	70	33	12	22	2	17	4	18	3	10	9
Ill. ²	61	31	5	19	7	18	7	20	7	12	13
Ind.	58	31	23	25	0	17	0	15	6	12	13
Iowa ²	40	29	20	23	4	17	12	20	12	11	12
Kans.	58	30	15	23	12	19	4	18	4	10	7
Mich.	60	33	17	22	2	17	3	17	5	11	13
Minn. ²	62	33	4	17	4	15	12	23	4	12	14
Ohio	71	33	12	22	2	17	5	18	2	10	8
Wis.	71	32	11	20	14	20	0	18	0	10	4
MIDWEST	62	32	11	20	5	17	6	19	5	12	11
Ariz.	69	32	19	26	0	17	6	17	0	8	6
N.M. ²	88	35	0	18	0	17	0	17	6	13	6
Nev.	—	—	—	—	—	—	—	—	—	—	—
Okl. ²	50	30	20	24	0	15	0	21	0	10	30
Texas ³	70	32	16	25	0	17	3	17	2	9	9
SOUTHWEST	71	32	15	24	0	17	3	17	2	10	9
Conn.	62	33	14	22	3	17	5	17	5	11	11
Del.	—	—	—	—	—	—	—	—	—	—	—
D.C.	72	33	12	22	8	18	4	15	0	12	4
Me. ¹	—	—	—	—	—	—	—	—	—	—	—
Md.	73	35	17	21	0	18	2	16	2	10	6
Mass.	53	31	15	22	4	20	0	17	1	10	27
N.H. ¹	—	33	—	21	—	—	—	—	—	—	—
N.J.	61	31	12	23	6	18	7	18	4	10	10
N.Y. ²	69	33	6	20	3	17	3	19	3	11	16
Pa.	65	32	10	20	5	18	8	19	3	11	9
R.I.	—	—	—	—	—	—	—	—	—	—	—
Vt. ¹	—	—	—	—	—	—	—	—	—	—	—
EAST	65	33	10	21	4	18	4	18	3	10	14
Calif. ²	68	33	6	18	2	18	8	21	2	10	14
Colo. ²	74	34	3	20	0	14	11	22	3	10	9
Idaho	86	34	0	21	0	16	7	21	0	8	7
Mont.	—	—	—	—	—	—	—	—	—	—	—
Nebr.	60	31	20	23	7	23	0	15	0	8	13
N.D. ²	44	28	0	18	11	17	33	28	0	9	12
Ore. ^{1, 2}	50	31	0	16	7	17	29	26	7	10	7
S.D.	—	—	—	—	—	—	—	—	—	—	—
Utah ²	59	30	0	16	0	14	18	26	12	14	11
Wash. ²	84	38	8	22	8	13	0	19	0	8	0
Wyo.	—	—	—	—	—	—	—	—	—	—	—
WEST	68	33	5	19	3	17	11	22	3	9	10
U.S. TOTAL	66	32	10	21	3	17	5	19	2	11	14

Where no figures are shown for a state, returns were too few to be statistically indicative. The column headed Weighted Rating takes into consideration not only the 1st place ranking but also the number of 2nd, 3rd, 4th, and 5th place positions given each group.

1. States in which there are no state societies of professional engineers affiliated with NSPE.

2. States in which there are associations of consulting engineers affiliated with the Consulting Engineers Council.

3. Texas has CEC affiliated association only in Dallas-Fort Worth area.

broken down into sections. The Southwest gives a few more first place rankings to the Professional Societies than do the other sections, and the West gives a higher percentage of first place ratings to Consulting Engineer Associations. This makes sense for both the California and Oregon Associations of Consulting Engineers have undertaken some sort of public relations program directed at potential clients.

Table 2A shows all these figures broken down by states, and it also shows the more meaningful weighted averages in red. These weighted averages were calculated in the same manner as described for Table 1A. The weighted ratings for the U.S. show: Individual Firms 31; Professional Societies 21; Technical Societies 18; Consulting Engineer Associations 19; and Others 11. These are the important figures. They show the relative value of the public relations work being done by each group in an effort to explain the function of the consulting engineer to the private client group. Here again, the total of all the efforts does not amount to much.

The "others" were generally the same as those listed in the discussion of question 1A, but to these should be added several votes for business and trade magazines going to the private client group.

The Slice of the Pie

This private client group has a lot of business it could give to consulting engineers. Just how much depends on business conditions in general and private construction conditions in particular. Consulting engineers are neither seers nor economists, so it would not be reasonable to expect them to know what business is going to be like in 1958. But they should be able to say whether their slice of the private clients' pie is going to be proportionately greater or less, no matter what the size of the pie.

Some 19 percent (almost a fifth) of those answering the questionnaire think their slice is going to be proportionately greater than last year. In other words, they think they will get some projects from private clients that would have gone to contractors,

manufacturers' engineers, or to the clients own engineering office if the job had come up last year. This would imply some favorable changes in the private client's understanding of the function of the consulting engineer—if this 19 percent is right.

The majority of the respondents (57 percent) do not think there will be much change in the proportion of this groups' business to consulting engineers. Things will be about the same with any up or down trends a reflection of general business conditions rather than a result of better understanding of consulting engineers by private clients. Obviously, this group thinks there has been no effective program to educate the private client group. Those who think the private client group will turn away from consulting engineers, and those who do not know, both come to 12 percent.

These figures, which are for the United States as a whole, are broken down into sectional figures in Table 2B.

The Public Client Group

Many consulting engineers work almost entirely for the public client group (Federal, State, County, and City officials and School boards, etc.). How well does this client group understand the function of the consulting engineer? According to the results shown in Table 3, they understand the consulting engineer a lot better than does the private client group. Better than twice as many (13 percent) think this public client group understands consulting engineers Excellently. Those who think the public client group understands them Fairly Well comes to 58 percent; Poorly 21 percent; and Not at All 4 percent. This puts the majority opinion in the Fairly Well category, which is none too good. And to have a fifth who think the public client group understands the function of the consulting engineer poorly is an indication that there is much educational work to be done in this area.

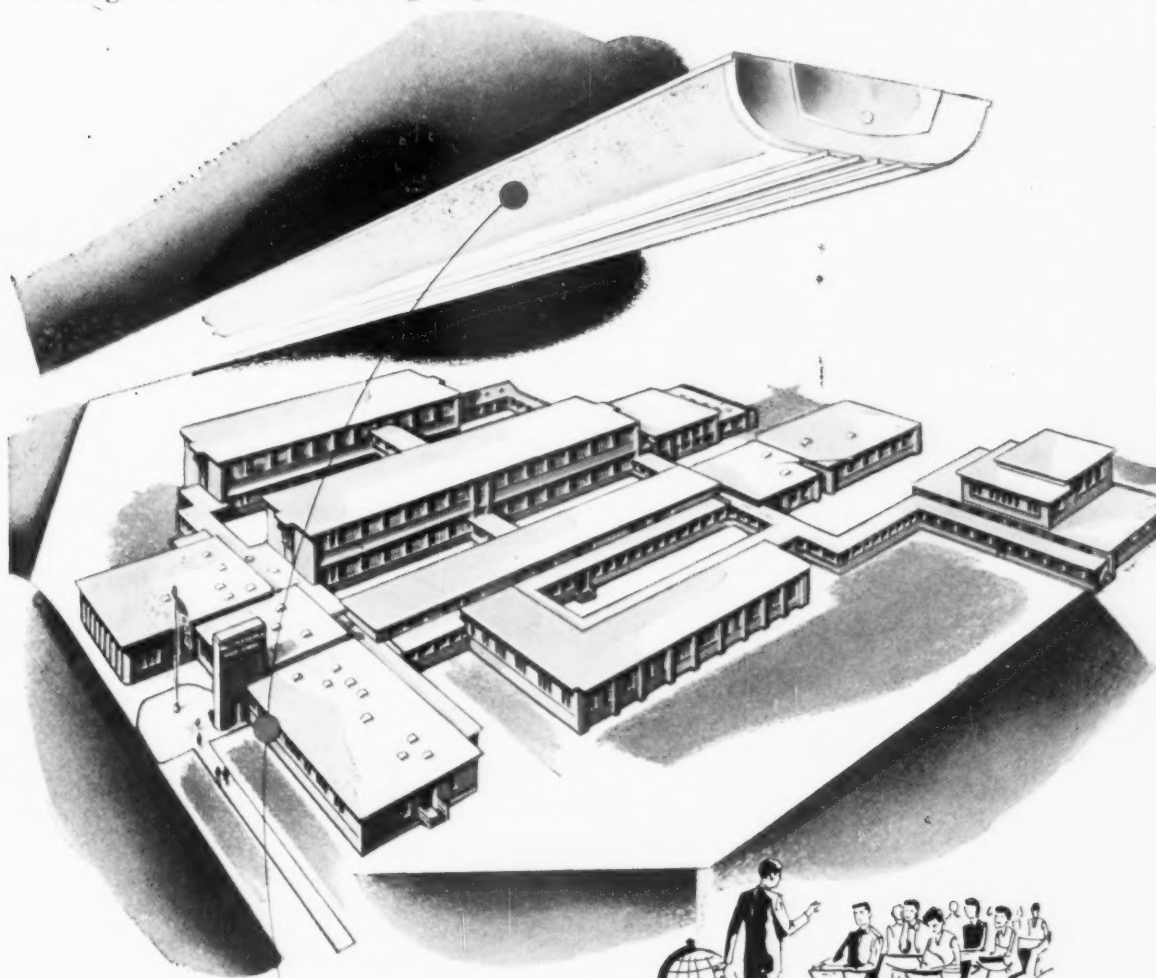
Chart 3A is similar to charts 1A and 2A, showing who the respondents think is doing the best job of informing the public client group of the functions of the consulting engineer. Again it will be noted that for the country as a whole, most of the educational work is being done by the individual firms. The professional societies come in second, followed by the consulting engineer associations and the technical societies. Trade magazines going to government offices were high among other influences.

Table 3B shows how much of a slice of the public works pie consulting engineers think they will get in 1958. A quarter think they will get a greater share than in 1957. More than half think it will be about the same, and a small 6 percent think it will be less. The Southwest is a little more optimistic than the other sections of the nation, while the West is more pessimistic. This relatively discouraged attitude from the West is heavily weighted by Cali-

4B — In 1958, I expect architects to engage consulting engineers on a () percentage of the work than this year.

Section	Greater %	Same %	Less %	Don't Know %
South	23	59	6	12
Midwest	16	59	10	15
Southwest	17	63	11	9
East	11	62	8	19
West	15	66	8	11
Total U.S.	16	61	8	15

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for California, where law forbids the use of consulting engineers on State work. Naturally, consulting engineers in California cannot expect any increase from State public work projects as long as this law is on the books.

Expectations for an increased share of the work are greater in the public client than in the private client area. This, undoubtedly, can be attributed to the Federal Highway Program, in which consultants expect to share.

Architects as Clients

Another client group with whom many engineers work is composed of architects. Tables 4, 4A, and 4B show the situation where architects are the engineer's clients.

Architects, who also are professional men, certainly should understand excellently the function of the consulting engineer—if anyone does. Table 4 shows what consulting engineers think about it. Of the consulting engineers who answered this survey, about a third think architects understand the function of the consulting engineer Excellently. About half say Fairly Well, while 10 percent say Poorly.

Again, as shown in Table 4A, it is the individual firm that is doing most of what is being done to show architects how they should be using the services of consulting engineers.

In Table 4B, it is clear that engineers expect to get about the same percentage of architectural business as in 1957. Some 16 percent do expect to get a larger share of this pie, while half that many expect to get less. Presumably, there is still some engineering work that architects should be turning over to consulting engineers that will continue, in 1958, to be done by employee engineers in architectural offices, or even by architects, themselves, aided, no doubt, by free engineering from some manufacturers.

Summary

In brief, this survey showed that in the opinion of consulting engineers:

¶ The general public understands the functions of the consulting engineer somewhere between Poorly and Not at All.

¶ Whatever educational work is being done is largely the result of efforts by individual firms of consulting engineers.

¶ If the general public did understand the function of the consulting engineer, it would increase the amount of work consulting engineers would get to a considerable extent.

So far as the private client group is concerned:

¶ They understand the consulting engineer something less than Fairly Well.

¶ The individual firms of consulting engineers are largely responsible for whatever educational work has been done.

¶ It is likely that engineers in private practice will get a slightly greater share of this private client work in 1958.

The public client group is somewhat different:

¶ They, too, understand the function of the consulting engineer a little less than Fairly Well, but a little better than the private client group.

¶ Individual firms have done most of the educational work in this area.

¶ Consulting engineers will do better here than with the private client group in getting a greater share of the work in 1958. This is a reflection of the increased amount of highway work that will go to consulting engineers.

Architects are also professional men. They should be very different from the private client or public client groups.

¶ They do understand engineers somewhat better than Fairly Well—there is a leaning toward Excellently.

¶ It is the work of the individual firms that has brought this about for the most part.

¶ It is likely that the share of the architects' engineering work that will actually go to consulting engineers will be about the same in 1958 as in 1957—with just a possibility of some increase.

It is clear that in all areas, the functions of the consulting engineer are not understood as well as they should be. Most of the publicity and educational work is being done by individual firms of consulting engineers. But it is not enough. The professional societies are running a rather poor second, while consulting engineer associations and technical societies are hardly in the race except in a few states.

Actually, the professional societies should not be criticized for this, for only a small percentage of their members are in private practice, and they cannot be expected to spend a large proportion of their time and income trying to improve the lot of consulting engineers in particular.

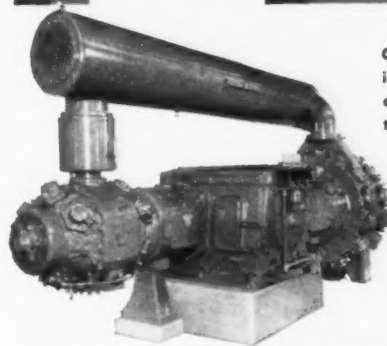
The consulting engineer associations do not have this excuse, but they are young and are functioning in less than half the states. They should not be judged for a few years yet. The technical societies do not need to apologize at all. This is really not their affair—or only to a limited extent. They are set up primarily to deal with technical matters.

More Next Month

This report covers only a part of the questions asked in the survey. It shows the need for effective publicity, public relations, and educational programs. The final half of the report, to be published in February, will show what methods are now being used and discuss what is being planned by individual firms, professional societies, consulting engineer associations, and technical societies to tell the general public and the various client groups what the consulting engineer can do for them. ▲▲

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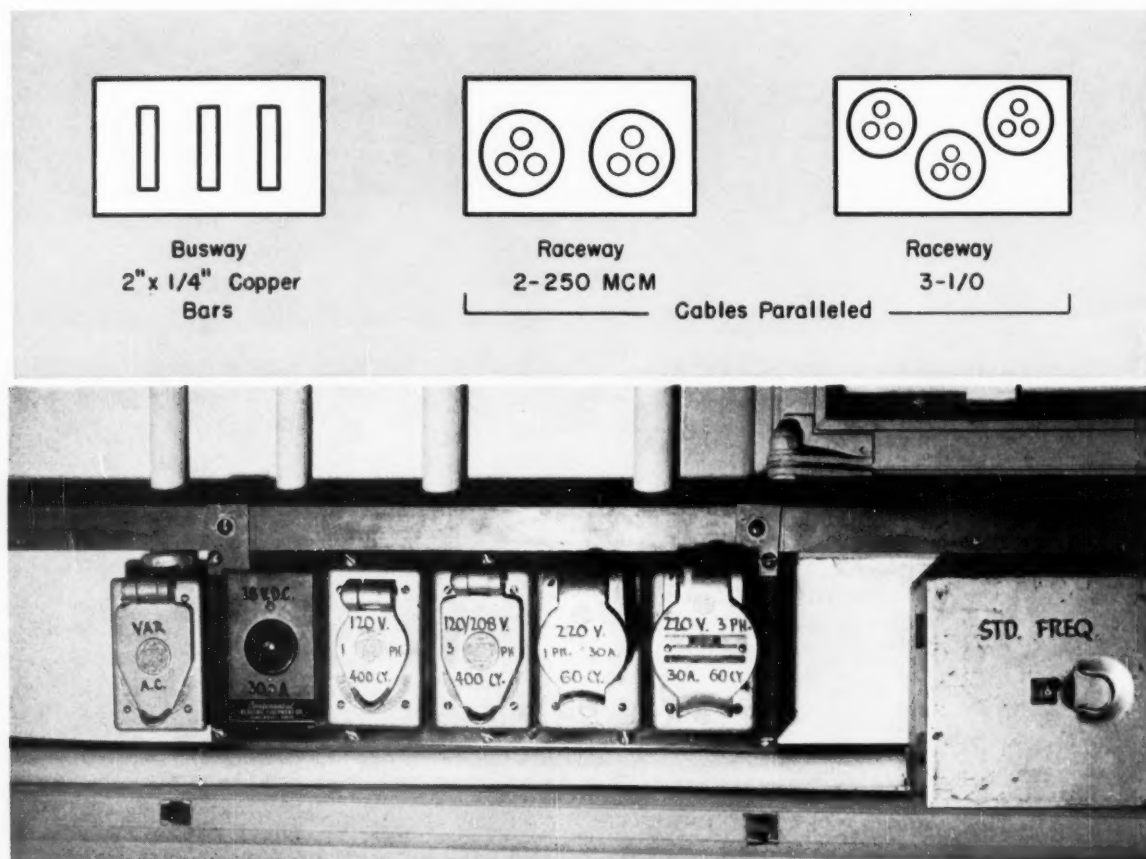


FIG. 1—PARALLEL CABLES HAVE LESS VOLTAGE DROP THAN A BUS AND MINIMIZE ANY NEW LOAD DISTURBANCES.

FIG. 2—TYPICAL INSTALLATION USING SEPARATE DISTRIBUTION SYSTEM FOR EACH TYPE CURRENT SUPPLIED.

New Ideas For Medium Frequency Distribution



EUGENE HERZOG, Eugene Herzog & Associates, Consulting Engineers

Eugene Herzog entered private practice in 1951. He has done electrical design work for the Air Force, municipalities, manufacturers, and architects. He has done considerable work in automation. Before entering private practice, Mr. Herzog was with the Wright Air Development Center and before that with the Chicago District Generating Company, the Thomson Research Laboratory of General Electric, and the Consolidated Edison Company of New York. He is a Fellow in AIEE, a member of NSPE, and the holder of several U.S. and foreign patents. He received his B.S. in engineering from the College of the City of New York and his Masters in electrical engineering from Massachusetts Inst. of Tech.

development Center and before that with the Chicago District Generating Company, the Thomson Research Laboratory of General Electric, and the Consolidated Edison Company of New York. He is a Fellow in AIEE, a member of NSPE, and the holder of several U.S. and foreign patents. He received his B.S. in engineering from the College of the City of New York and his Masters in electrical engineering from Massachusetts Inst. of Tech.

THE USE OF MEDIUM frequency power systems — from 60 cycles to about 3000-5000 cycles — has increased greatly in the last few years. The extensive use of 400-cycle power systems in aircraft brought about a corresponding increase in the use of ground power units at airfields for maintaining and servicing aircraft, and of power supplies of this frequency for laboratory use in research and development.

In the field of induction heating a more thorough analysis of needs has lowered the frequencies used, as larger pieces with deeper penetration are treated. Now, 1000-cycle heaters are in wide use, and some go much below this frequency. Similarly, it was shown that the efficiency of fluorescent lamp instal-

lations could be increased by the use of frequencies higher than 60 cycles. Cheaper ballasts and higher efficiency compensate for the cost of frequency conversion equipment leaving a sizeable saving on large projects. A number of 400-cycle systems have been installed, 800-cycle systems have been tried with success, and still higher frequencies are on the way.

Electroluminescence is still in the experimental stage, but the use of large surfaces radiating illumination is attractive not only for decorative uses in homes and places of entertainment but for industrial uses where low brightness sources are needed to furnish uniform illumination. Here, too, efficiency increases with frequency, and it may be expected that frequencies higher than 60 cycles will be used when commercial units become available.

Why Use Medium Frequency

Variable and controllable frequency systems are used for the speed control of industrial equipment. They usually are designed to operate around the 60-cycle speed because such equipment is readily available. As higher speed equipment is developed and becomes available it will be used more often in drives to eliminate step-up gears, to give wider range speed control, and to permit the use of smaller size units with less mass and inertia. Powered wind tunnel models now are driven with high speed motors; the textile industry is using them for very high speed drives; machine tools use them, especially in woodworking; and other industries will find applications as soon as engineers become familiar with the availability and reliability of this equipment.

It may be worth while to discuss the reasons for the use of medium frequency power systems. The rpm of a constant speed electric motor, such as the ordinary induction or synchronous motor used in industry, depends on system frequency. On the 60-cycle system 3600 rpm is the maximum speed attainable by the usual motor. The same motor would reach 21,600 rpm on a 360-cycle system because both frequency and speed are six times greater. If the motor is built to withstand this speed, its power output also would become six times as large — a 10-hp motor becomes a 60-hp motor.

While the cost obviously will increase as a result of more costly construction, the mass of the motor will be much less even if special gearing is necessary. In the aircraft industry where weight is so important, the advantages of higher frequency equipment are decisive, as they are in the driving of a bobbin for reeling fine yarn. For powered wind tunnel models no other motor is usable in the limited space, and with many machine tools, fine cuts at high speed give a superior finish. In all these applications it is preferable that the driven equipment have a high speed output without any reduction gearing.

In induction heating, another important application for high frequency current, the penetration of

the heat is inversely proportional to the frequency. A thin skin may be heated quickly using a high frequency, but when a thicker layer or a whole piece is to be heated quickly, the frequency must be lowered. Induction heating may be fitted so nicely into automated production lines that its use has expanded well beyond surface hardening applications.

In illumination it was understood some time ago that the lighting unit became more efficient at higher frequency if the unit was a gas discharge or capacitance type. It took longer to realize that savings in the ballasts plus increased efficiency would compensate for the cost of the converter. This type of installation is particularly applicable to the lighting of large areas for long periods of time so that operating savings will pay for the cost of the installation. By raising the distribution voltage well beyond conventional values, a further increase in efficiency is attained. Because of this some of the undesirable characteristics of higher frequency systems (especially excessive voltage regulation) are eliminated.

Application Data

The most widespread use of medium frequency ground power systems has been for testing and development of aircraft components. This means that there is a great variation in requirements, depending on whether the system is used for testing motor operated pumps and landing gear, or for radio and radar testing. As a rule, control of both voltage and frequency is desirable; in research or development laboratories this control is essential. In 400- or 800-cycle lighting systems, however, conditions of use are essentially static and may be predicted with great accuracy during design.

To better illustrate the problems encountered in a laboratory, an installation designed some years ago will serve as an example. That 400-cycle system had frequency control; it had a sturdy distribution bus with many outlets located for convenience of the personnel. As a matter of fact, many types of power were available at each outlet. Because of the importance of the project, a high grade supply system was installed.

Some time after completion I was invited to visit the site and suggest improvements. I found that although the supply system was designed for possibly 30-40 users, it could be used by only one at a time. The trouble was that while one project required steady voltage and frequency, another user might wish to vary the voltage while a third needed to vary the frequency. To make matters worse, when conditions were stabilized for one test, switching in or out of other loads could not be tolerated.

This installation proves that it is necessary to consider the background of application if satisfaction is to be attained.

The consulting engineer designing a high frequency system will find that there are two basic

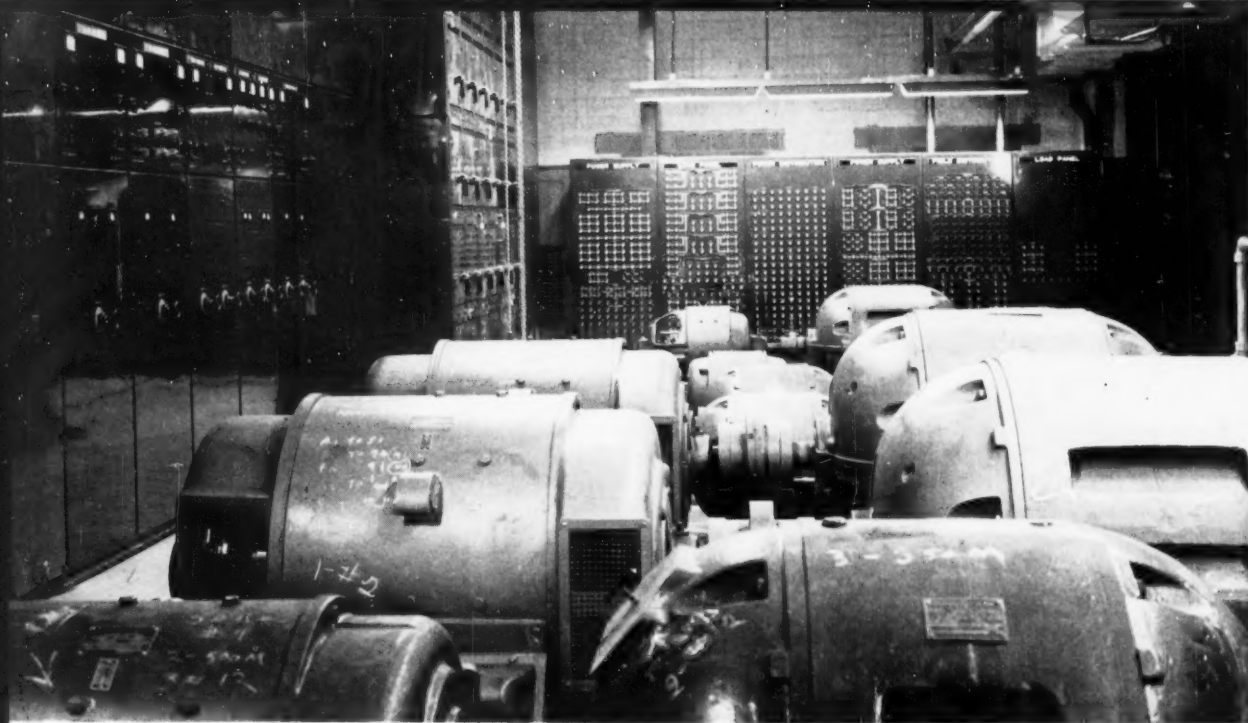


FIG. 3—CENTRAL PLUG-IN BOARD AND CIRCUIT BREAKER PANEL FOR SYSTEM USING ONLY ONE SET OF WIRES.

types of applications. The first requires only 400 cycle, 120/208-v, three phase or its corresponding single phase power; steady power as to voltage and frequency is the main consideration, and mutual disturbances coming from a variety of users must be minimized. The second type of application is a more difficult problem — each user may want different conditions as in the example given. Not only must mutual disturbances be kept under control, but each user must be given individual choice as to voltage and frequency.

In addition, it is important to consider certain characteristics of the 400-cycle sources such as noise, wave shape, and harmonic content of output. Improvements have been made in the last few years but not by all manufacturers. Therefore, it is necessary to make a thorough study of equipment before writing specifications.

The 400-cycle generators are usually noisier than 60-cycle units. The shrill tone is particularly disturbing to some people, and there is frequent objection to locating these units close to the user. Some manufacturers have been able to decrease this noise through a more careful design of the magnetic circuit and the winding of the motor and through the gradual elimination of components resonant to motor frequencies.

The wave form and harmonic content of the voltage and current wave may be poor. Larger machines tend to be better in this respect. Quite often the manufacturer uses a unit larger than is necessary to permit suitable winding distribution for suppression of objectionable harmonics. The generator may produce large quantities of undesired power at fre-

quencies other than that for which it is designed. These harmonics are multiples of the basic frequency and may range into thousands of cycles. They increase the losses and do not permit the driven equipment to perform as efficiently as with better designed generators. The existence of these harmonics may be noticed quickly by distortion of the wave shape if one cycle of the voltage wave is reproduced on a large size cathode ray oscillograph. On very small machines it is difficult to arrange the windings so that these harmonics are completely suppressed.

Acceptance Test Useful

In the last few years rigid specifications by the Air Force and its suppliers forced most manufacturers to redesign their units for improved performance. It is, however, still desirable to perform acceptance tests to insure that the generator meets the specification requirements. The output of a good generator should not exceed 3-5 percent in harmonic content, and should be preferably less. However, this rigid a specification should not be written unless the use warrants the extra cost.

If exactly 400-cycle output is required, it is important to know that only one practicable pole and speed combination will give this with 60-cycle drive. A 1200-rpm unit with a 6-pole motor and a 40-pole generator will give the correct output. Even then only a synchronous motor drive would give the correct frequency. An induction motor drive would give a lower frequency because of loss of speed resulting from slip. Another approach is to select a speed and pole combination that will give a frequency too high, such as a 42-pole generator, then

permit the slip of the induction motor drive to bring it down to about the correct value. The needs of the job will determine the best approach.

Electronic converters at present are available only for small outputs, are expensive, and usually have poor wave form.

Increased frequency means that the reactance of an electrical device is almost seven times larger on 400 cycles than on 60 cycles. Thus, the voltage drop in the generator and distribution lines increases almost seven times unless proper measures are taken to control it. Engineers and contractors may forget about this and attempt to cut voltage drop by increasing the conductor size. Such procedure will give practically no relief beyond the thermal limit.

The proper solution is to subdivide the conductor into parallel, insulated conductors, and properly arrange them in relative positions for lesser reactance. The selection of the number and size of the parallel paths may require some engineering judgment to determine the balance between improved performance and increased cost. Increasing the number of smaller conductors will increase the cost rapidly, while the improvement brought about in reduced reactance is limited. It is usually desirable to tabulate the impedances, voltage drops, and costs for various combinations to permit the most economical selection.

The recently introduced low impedance plug-in bus combines low impedance and low voltage drop with a plug-in feature which permits connecting loads at any point. This busway may be useful for short distribution systems. At this writing insufficient technical data are available for a definite state-

ment. For distributions over 100-ft long it is fairly clear that even this busway is not applicable.

Typical Designs

Two typical designs will indicate the proper engineering approach to the two types of installations that have been mentioned as representative of the usual requirements.

Although often used in other than production type installations, the system that requires only the delivery of power at rated voltage and frequency is suitable for shop and hangar use and for some laboratories. It also is suitable for medium frequency lighting, heating, and similar industrial systems.

If frequency is a sensitive item, a synchronous motor drive is recommended. This increases the cost somewhat but fixes the frequency independent of load variations. The induction motor drive is cheaper, more rugged, and simpler, but will give 2-3 percent frequency variation with a change in load.

The important point in this design is to keep the voltage drop caused by load change at a minimum. Parallel conductors will have a lower voltage drop (for the same amount of copper) than a single heavy conductor such as a busway. As the current and frequency increases, unequal current distribution through the conductor, from skin and proximity effect, further increases the advantage of subdivided conductors. It then may be necessary not only to subdivide the supply into several parallel conductors but to locate the conductors carefully to decrease the mutual magnetic effect of one current path on another. The minimum voltage drop will result in

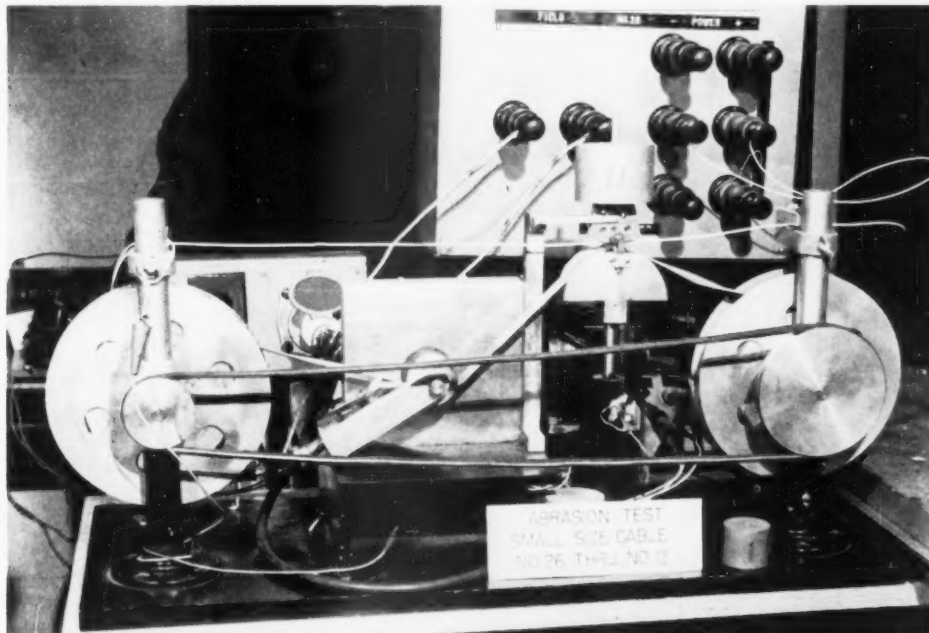


FIG. 4—RECEPTACLE END OF PLUG-IN SYSTEM USING ONE SET OF WIRES FOR DISTRIBUTION.



FIG. 5—THESE 440-V OUTLETS ARE FED FROM PORTABLE CONVERSION UNITS LOCATED IN CRAWL SPACE UNDER THE FLOOR OF NEW LABORATORY.

a minimum disturbance upon application of a new load and in a minimum interference with the smooth performance of other loads operating on the system. (See Fig. 1.)

In a recently constructed 400-cycle system in an electronics laboratory, the system spreads about 200 feet in each direction from the central generators. There are 24 outlet points, each provided with a distribution panel. The source consists of two, 40-kw motor-generators. The distribution trunk is made up of three, 4-conductor 1/0 cables in parallel, installed in a 6-in. raceway. This is arranged so that taps could be taken off anywhere on the cables. The arrangement has all the conveniences of a busway but costs less and gives less voltage drop. With the most unfavorable loading the voltage drop is less than two percent. With the voltage regulator set to hold voltage at the midpoint of the span this can be cut in half. The installation cost about \$36,000, exclusive of the motor-generators.

It may be worth while to mention that a busway and receptacle system of about the same dimensions but lower output, constructed elsewhere, cost more than double and did not have as good voltage regulation. A similar system which was changed to busway from paralleled cables by the user at the contractor's suggestion, was found to be unusable because of excessive voltage drop. This situation may change somewhat in the near future by use of the low impedance plug-in bus mentioned.

Laboratory Type Installation

With laboratory installations it is most important that different users have independent control of the supply. In other words, the supply is only nominally 400 cycle, 120/208-v; it may be held at this value or frequency and voltage may be varied or held continuously at some other nearby value. If there are a number of users this poses quite a problem because a central system can provide only one voltage or frequency at any instant.

The problem and a solution may well be described more clearly by an example. This was an actual job

though many of the minor complexities are omitted.

A laboratory of about 100,000-sq ft area and of the spread out wing type construction needed a rather complex electrical distribution system. A basic distribution of 440-v, 60 cycle covers the entire building with ample capacity to operate a 100-hp motor or equivalent furnace or other device at any point. In addition, various direct current and assorted frequency alternating current power supplies are required — at least 20 kinds. These had to be made available at any point, but demand is small and use is infrequent.

Two standard methods, and some of their combinations, were studied. The method of providing separate distribution systems and individual outlets (See Fig. 2) became not only expensive but unduly cumbersome, tying up too much expensive building space for such infrequent use. In the plug-in or patch system, each room is connected to the central supply with only one set of wires. The same wires are used to supply different kinds of electricity at various times by connecting them to different generators. (See Fig. 3 and Fig. 4.) It is usually good economy to use the same set of wires for several outlets to cut wiring costs.

The plug-in system looked more favorable economically, but not operationally. A minimum of eight wires had to be provided for power and control to every room. If these wires were common for several outlets, then the possibility of independent operation was curtailed. Either way the central power center, with its generating and distribution equipment, was large, complex, and a serious operating problem. Safety to personnel and equipment was also an important consideration where so many serious mistakes could be made. In the plug-in system the central operator might furnish the wrong kind of electricity or the user might forget to request a change. With relatively powerful power supplies there are too many chances to ruin expensive equipment or injure personnel.

Noting that 440-v outlets had to be provided in every room → and that these had to be of greater

capacity than any of the special power supplies required — gave the clue to the solution. (See Fig. 5.) It was decided to provide a central stock of small, portable conversion units which could be set up in any room, and plugged in to provide the special frequency or voltage needed. (See Fig. 6 and Fig. 7.) The shrill noise of the units at first was considered a serious stumbling block. (This noise is due to a number of factors but mainly to magnetostriction, or the cyclic expansion and contraction of the iron of the magnetic circuit in the generator.) However, it was noted that a crawl space was available under the entire area, and means were found so that the portable generators could be located in this space wherever they were put to use. Not only did this solve the immediate problem of supplying a variety of voltages and frequencies, but it permitted unlimited addition of more varieties in the future by purchase of proper conversion units.

This method not only saved about \$250,000 compared to the nearest method with equivalent capability, but had many additional advantages.

There is absolutely no interference between various users; each one may use and vary his source to suit himself without bothering any other user.

The capacity of the supply can be adjusted easily to the requirements of the job. As long as several 400-cycle units must be stocked these may be of two or three sizes so no one need use a unit much larger than required.

The ease of provision for the future means that no idle investment or rebuilding is necessary. Additional units can be purchased later as needed and to specifications to suit the particular application.

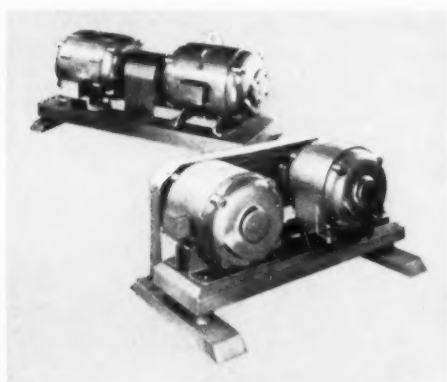


FIG. 6—SMALL VARIABLE FREQUENCY POWER SUPPLIES SUITABLE FOR LABORATORY USE.

FIG. 7—SEVERAL SMALL FIXED FREQUENCY POWER SUPPLIES ALSO ARE AVAILABLE.

It is interesting to observe the variety of supplies provided by this method:

- ¶ 60 cycle — 110, 220, 440-v single phase and three phase and 120/208-v three phase
- ¶ 400 cycle — 110, 220-v single phase and three phase and 120/208-v three phase
- ¶ 800 cycle — 120/208-v three phase
- ¶ 1600 cycle — 120/208-v three phase
- ¶ Direct current — 6, 12, 24, 115, 230, and 660-v

Conclusion

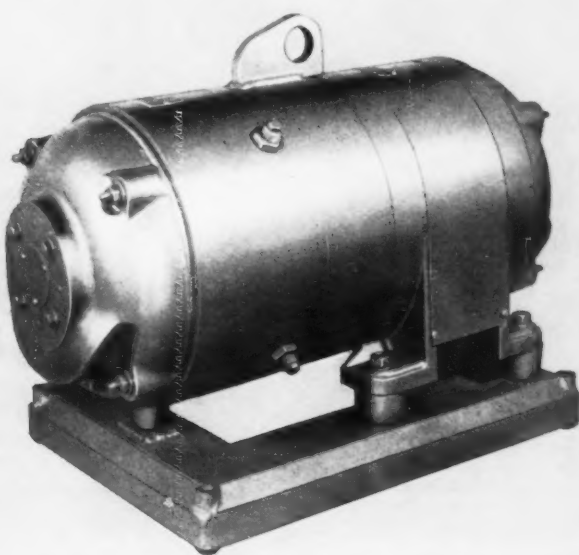
In any power system where voltage drop is a serious consideration, such as 400 cycles or higher ac power or low voltage, dc power, this fact will present a serious limitation to the extent and loading of the system.

Where a fixed voltage and frequency is required at all points, a distribution designed for minimum voltage drop (considering frequency) is required. On 400 cycle or over this usually means parallel conductors, arranged to give minimum reactance and sized according to thermal considerations.

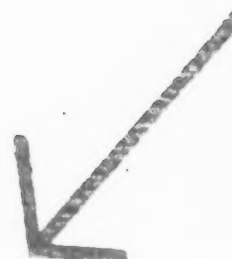
Where the requirements vary from point to point or where the requirements are very stringent as to mutual interference of the various users, a central system is best avoided. Separate conversion units, located as close as possible to the user, are advisable. They are not only less expensive but better.

Where many people will use a medium frequency power supply but each of them only occasionally, then one portable unit can serve several people. A relatively small central pool of portable units will service a large organization. The central stock room should service and install the units so they are promptly available when needed. Proper maintenance is very important.

Contractors not familiar with higher frequency construction must be required to follow the consulting engineer's design exactly. ▲▲



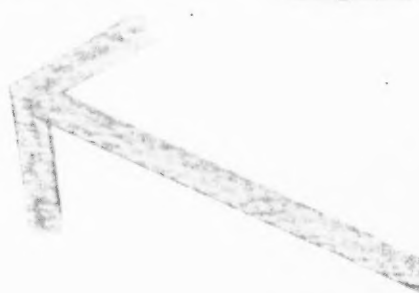
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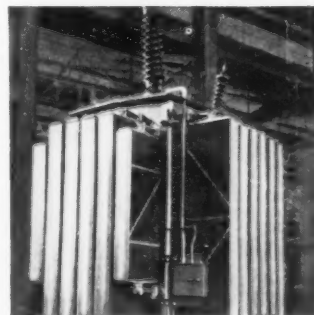
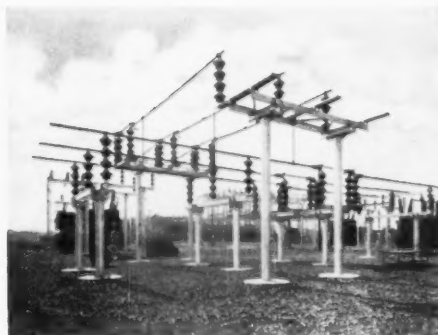
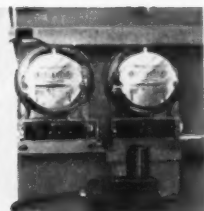
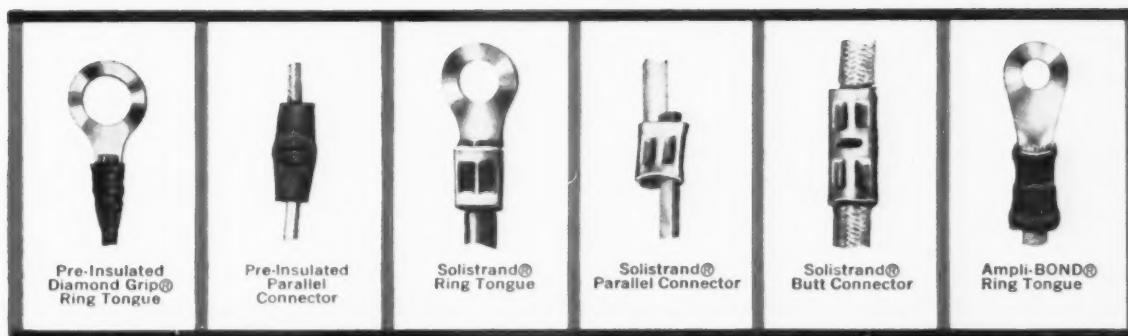
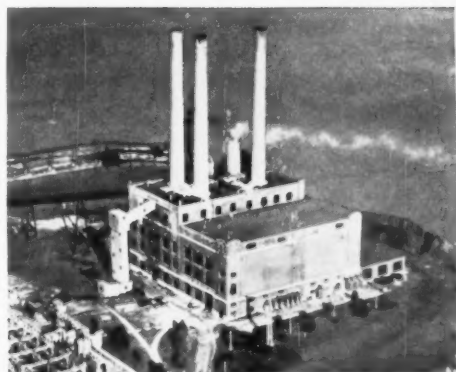
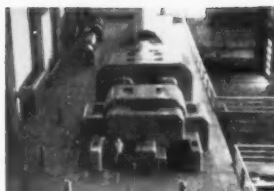


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ANDREW J. HOFFMAN, Ebasco Services, Inc.

Andrew J. Hoffman has been with Ebasco Services, Inc. since 1940 and has been coordinating and supervising the Greek Power Program under the direction of H. L. Melvin, Ebasco's chief consulting engineer. Before he joined Ebasco Mr. Hoffman was division engineer for the Public Service Company, in Chicago; construction manager for the former General Engineering & Management Corporation and executive manager of several properties of the National Public Service Company. He was

also at one time electrical engineer and cost engineer for the Public Service Commission of the State of New York on several large metropolitan utilities, and officer-in-charge of construction projects for the U. S. Army. Mr. Hoffman attended Iowa University and is a graduate electrical engineer from Tri-State College. He is a licensed professional engineer.



Greece Gets a New Power System

CE exclusive EBASCO'S GREEK PROJECT probably was one of the most unusual engineering assignments in history. We were asked to start from scratch and plan and supervise the building of a power network covering Greece and, at the end of five years, to turn over a smoothly operating and trained utility organization to the government. The deadline was met, and Ebasco now is acting only in an advisory capacity.

Greece is the first nation to build an entire new power system and distribution network as a single project. Because there were no transmission lines or power plants of size (except in Athens) on which to base the system, it was possible to build one of the simplest, low cost, power systems in the world. All equipment is modern and of good quality. The power system network uses a single transmission voltage, a single primary distribution voltage, and a standardized secondary voltage.

After World War II, Greece was a poor country with a large population. Among all the European countries, Greece had about the lowest power generation and consumption record in 1945. Over one-half of the population had no electricity at all. Most of the existing generating facilities, again excepting Athens, were obsolete and inadequate.

During the War, Greece was occupied first by Italy and then by Germany. The occupations by these nations caused a population movement to the cities. Although the Italians and Germans did not seriously damage the power producing equipment, the population movement resulted in city systems being overloaded, and necessary repairs and expansion were impossible at the time. Later, the meager power facilities in some sections were heavily damaged during the period of guerilla warfare against the communists.

When the Economic Cooperation Administration first began investigating the economic situation in Greece, the development of power was considered,

from the beginning, as necessary for the postwar economic rehabilitation and development of Greece.

Walker Cisler, president of Detroit Edison Co. and chief power consultant to the Marshall Plan Program, initiated investigations to see what could be done to help Greece. He recommended that the best incentive to reverse the population movement from the cities and rebuild the economy of the country would be an adequate supply of electric power over the entire mainland for both industrial and domestic use. Cisler's suggestion was that an American engineering firm be employed to study the power problem in detail, recommend what facilities should be provided, and estimate the costs of these facilities.

Awarded the contract by joint agreement of ECA and Greece, Ebasco began a complete economic study in 1948. At the time, guerilla warfare was raging in parts of Greece. Frequently before entering an area to make the survey, Ebasco personnel had to wait until the shooting stopped.

More Debits Than Credits

Looking into the Greek economic picture, Ebasco found a nation with more power debits than credits. With no developed hydro or fuel resources of its own, Greece was importing oil for its meager generating facilities. Lignite was being mined in many parts of Greece but in small quantities. Although the deposits had been studied by French, German, and British engineers, wars prevented any major development.

Ebasco sales and marketing specialists were sent to obtain all available information on existing and prospective electrical loads and to make a prediction of electrical needs over a 10-year period.

Investigation of Greece's hydro resources presented complex problems. Data with respect to stream flows, rainfall, storage reservoir capacity, dam sites, and geology for the hydro projects under



THE 50-MW LADHON STATION IN PELOPONNESOS (SOUTHERN PART OF GREECE) FIRST WENT INTO OPERATION IN JANUARY OF 1955

consideration were very limited. In order to assemble all of the experience and data available and to be certain that the results of the investigation would be conclusive, Ebasco arranged for the association of two firms having had experience in Greece — Knappen-Tippetts-Abbott-McCarthy and Raymond Concrete Pile Company — to assist with the surveys and geological and core drilling investigations. In addition Mr. Maurice Scharff, Consulting Engineer, was associated with the program as an over-all consultant because of his earlier work on the Greek power situation for UNRA.

New Lignite Sources

After extensive investigations, the Ebasco team discovered 30- to 50-million tons of recoverable lignite on the Island of Euboea, about 70 air miles from Athens. Less than 10-million tons had originally been predicted for the area. Though of rather low heat value (5000 to 7000 Btu per lb), the lignite was acceptable for power plant uses.

Pierce Management Company of Scranton developed these lignite mines and trained the Greek personnel to operate them. Today over 50,000 tons of lignite are mined monthly. A small portion of this is sold. This discovery of major lignite resources, near Athens, has been termed "perhaps the most important contribution to Greece of the ECA power program." Besides furnishing a much needed fuel source, the lignite mines have provided permanent jobs for 1400 miners in an area which offered few opportunities. By lessening the need for imported oil, the lignite also has saved the Greek government an estimated \$4,000,000 a year in foreign exchange.

Existing Facilities

Touring the country to study existing electrical facilities and make load forecasts, Ebasco personnel found small towns with amazingly low use of and

access to electricity. The average annual per capita consumption for electric energy was 40 kwh throughout the whole country and only 84 kwh in the actual serviced areas. Electric service was available to only 48 percent of the population, and in other areas of Greece, outside the capital area, the per capita annual consumption averaged 31 kwh. In 1955 the per capita consumption had risen to 148 kwh when the average per capita national income had risen to 230 U. S. dollars. Excerpts from one inspection trip report in 1952 showed:

"The villages of Aliveri and Karavos are supplied from a diesel plant in the town of Aliveri. Present plant capacity is 75 kw, 220-v dc. This system will have to be rebuilt before it can be supplied with 220/380-v ac service from a 15-kv line from the Aliveri steam plant. The 1950 population was 3237; the peak load was 36 kw.

Nea Artaki—The present plant capacity is 35 kw with 220-v dc distribution. The distribution system was built about two years ago. Poles are in good condition, but the wires would have to be rearranged to serve 220/380-v ac. The 1950 population was 2951; peak load was 16 kw.

Moustheni—The present plant capacity is 11 kw. The diesel unit is used in the daytime to run a flour mill and at night is connected to the generator and supplies 220-v dc service. The population is 1950; peak load is 6 kw."

Light Loads

In some of the small towns, the electrical plants were operated only about two or three hours each night. Electricity was rationed. If a home did have electrical power, many times the house would have only one 10- or 25-watt bulb. The light would not be turned on until it was so dark that a kerosene lantern would have to be lighted before the electrical switch could be found. Even in some of the larger

cities, modern homes were being built with no electrical wiring.

Ebasco's studies embraced the selection of distribution voltages, both secondary and primary, best suited to serve the expected loads; comparison of alternate transmission voltages and systems for delivering power to load centers from proposed hydro and thermal plants; investigation of stream flows, surveys of reservoir sites, geological examinations, and core drilling at dam sites; and search for fuel for thermal power stations.

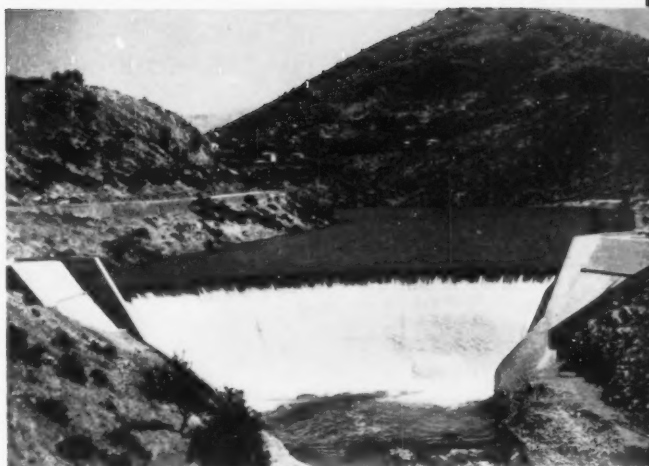
Interconnected Supplies

While planning the engineering designs, Ebasco excluded the alternative of a single source of energy and adopted the principle that it was most desirable to have several scattered but interconnected sources of energy, arranged so that each source could service a large area.

The power system was planned with simplicity as the keynote. The simplification and standardization possible (because the system was being built from scratch) resulted in a low over-all investment and low production, maintenance, and operating expense. Planning also provided for ease of maintenance; simplified load dispatching; and future expansion.

The Greek government concurred with the surveys and designs of Ebasco with no reservations.

After the studies were completed, a number of large engineering firms were considered for the jobs of organizing a Public Power Corporation, undertaking the design, and supervising the construc-



LOUROS, A 5-MW STATION IN NORTHWESTERN GREECE.

tion. Ebasco again was selected by joint action of the ECA and the Government of the Kingdom of Greece.

Theoretically speaking, Ebasco was Greece's Power Corporation in the beginning. Contractors were selected for the various hydro and lignite electrical plants. Ebasco also wrote specifications and selected the contractors, and with the approval of the Greek Government, supervised the work.

The agreement between the Greek government and Ebasco stipulated that until such time as the contractors completed their tasks, the general manager of Public Power Corporation (PPC) would be the Ebasco representative in Greece, who was authorized to employ and to dismiss at his discretion all personnel of the corporation. The Greek government had expressed a desire to have PPC organized on the basis of American standards and have it acquire the American spirit in both the construction and the operation of the power projects.

The Public Power Corporation

PPC is a state corporation operating under the rules and regulations of private economy, as an organization administratively and financially independent, not subject to the direct and indirect control of the state on matters pertaining to its internal administration and organization. The corporation is authorized to represent the Greek government and to take final action in its behalf on any question regarding the power development program, within the framework of the standing legislation which provides for the way in which the corporation is controlled by the Minister of Interior.

The PPC has a 7-member board, a 27-member representative assembly, and it is subject to the audit of a 3-member audit board reporting directly to the General Assembly.

In order to train personnel for PPC, Ebasco engineers were sent to Greece. Although Greece had



AN ORTHODOX PRIEST (RIGHT) BLESSES THE ARRIVAL OF ELECTRICITY IN A SMALL GREEK TOWN.

a sufficient labor supply, it was untrained. Hiring everyone from the youngest power engineers to prospective PPC management (about 1200 persons), Ebasco's next job was to train this personnel. Individually planned training programs were inaugurated, and 51 selected Greeks were sent to Ebasco offices in New York. These men then were placed in departments similar to those in which they would be working in Greece. Next, the Greeks were sent to utilities all over the United States for six months to one year of additional training. In order to broaden their perspective, the trainees were kept at each location a limited time, then sent to a power installation in a different part of the country.

Financing the Project

The over-all program, which was completed on schedule, in 1955, at a total cost of \$111,000,000, included more than 800 miles of 150,000-v high-tension transmission lines, 19 substations, and 3000 miles of 15,000/230-380-v local distribution lines to 397 towns and villages.

Financing the initial phase of the power program came from four principal sources: (1) Italian war reparations amounting to the equivalent of 30 percent of the total cost; (2) Greek drachmae equivalent to 45 percent, supported in part by counterpart funds from the Marshall Plan Program; (3) European payments union, 15 percent; and (4) direct U. S. dollar aid funds totaling about 10 percent.

Major equipment for the hydro plants was supplied largely by European manufacturers, with preference given to Italians because of the terms of the Greek-Italian Peace Treaty, which provided reparations to Greece in substantial amounts. This agreement would have become void if the reparations were not accepted by specified dates.

New Power Plants

The power project included:

Aliveri — 80,000-kw lignite-burning thermal plant, Burns & Roe, Consultants, completed July 1953.

Louros Hydro Station — 5000 kw, Omnium Lyonnaise of France, in association with ETEP Commercial and Technical Co., of Athens, completed in March 1953.

Agras Hydro Station — 40,000 kw, Societa Edison of Milan, started supplying power to northern Greece in July 1954.

Ladhon Station — 50,000 kw, Societa Edison of Milan, placed in operation in January 1955.

Two plants now are under construction. Megdovas, a combination irrigation and hydro project with 80,000 kw of installed capacity, is scheduled for completion in 1960. Ptolemais, a 70,000-kw lignite-burning steam plant in Northern Greece, is scheduled for 1959 operation with an additional 100,000-kw unit planned immediately thereafter. Also, the 20,000-kw Edessa hydro project, developing the re-

maining head of the Vodas River below Agras, is expected to be completed about that time.

The power system, with radiated distribution lines from major Greek cities, is being continually expanded. At present, the Greeks are considering extension of the power program to nearby islands.

As anticipated, the distribution system has presented the most difficult, complex, and time-delaying problems. PPC has embarked on a 3- to 5-year program of purchasing these isolated systems and setting up large distribution divisions in line with the pattern generally established in the United States. The municipalities and other owners of the private power sources are being given the value of their property plus severance value. The severance pay represents a percentage of net profits for several years. Value of the utilities is decided by a PPC appraisal.

A Paying Concern

The total funds required for the expansion of the system throughout the country from 1957 to 1976 is presently estimated by the Greeks at approximately \$750 million. PPC currently contemplates that most of the funds will be available from their own resources, and they will try to secure the additional amounts required from either the local or the international money market.

Completing the job on schedule, Ebasco was able to turn over PPC as a paying concern to the Greeks on Aug. 1, 1955. Since that time, Ebasco has been retained purely on a consulting and advisory basis.

The Greek government has announced that no attempt will be made to subsidize service of the PPC. Although the rates are less than those of the early Greek utilities, they still are high compared to electric service rates in the United States.

The Whole Economy Affected

In addition to the obvious benefit of power being supplied, Ebasco's Greek project has made many other changes in the Grecian economic picture. At present, for example, Ebasco advisors are helping conduct an educational program to encourage home-wiring and the use of electrical appliances, which are being manufactured in an increasing number in Greek industrial plants.

Industry production costs, as a result of the now plentiful power, have decreased, and industries are moving to Greece in numbers beyond expectations.

Even a gradual change in Greece's barren landscape is predicted. With no other source of fuel, the Greek peasants burned any wood they could find. Since this has been going on for centuries, Greece is nearly a timberless country. The lignite mines should change this. In addition, lands that once were arid now are being irrigated.

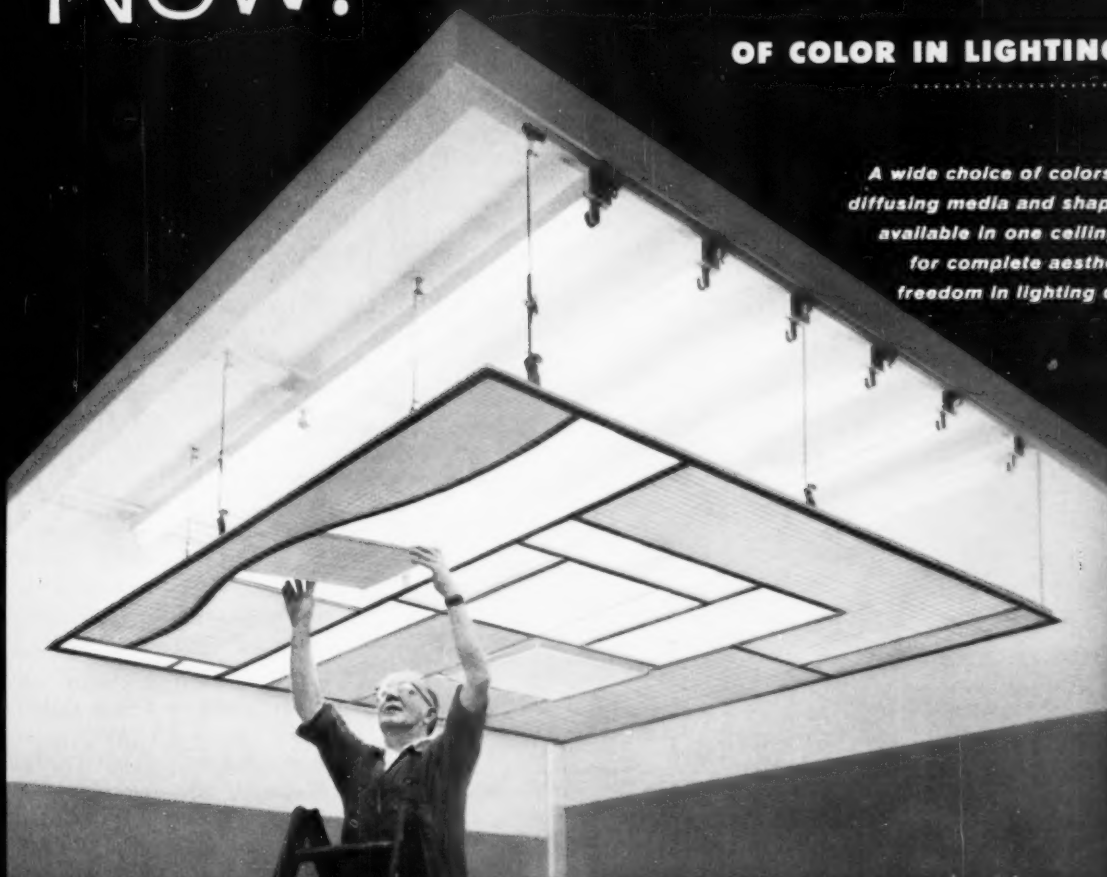
As a PPC official recently pointed out: "We do not promise miracles, we generate them." ▲▲

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*A wide choice of colors,
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for complete aesthetic
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View of test ceiling at our plant.

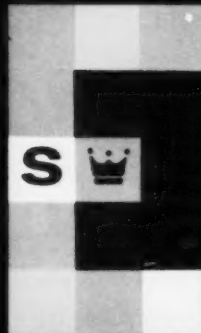
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Design of our Overlap Polycube® Louver (1/2" cube), on 2-ft. wide modules eliminates the necessity for crossbars, regardless of how long the run . . . also provides 45° x 45° shielding for optimum seeing comfort.

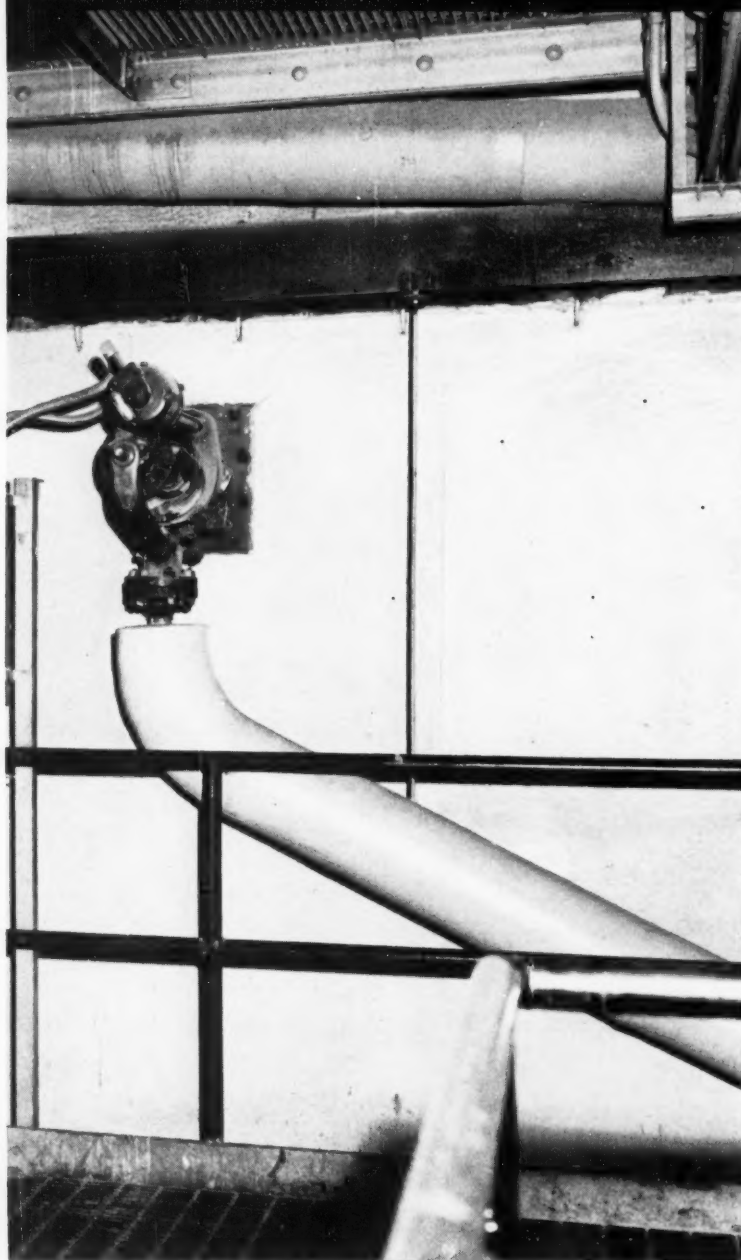


Dished plexiglas ceiling with perimeter of green "Polycube" Louvers helps give this office a distinctive appearance.

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See the B-H catalog
in Sweet's Plant
Engineering File.



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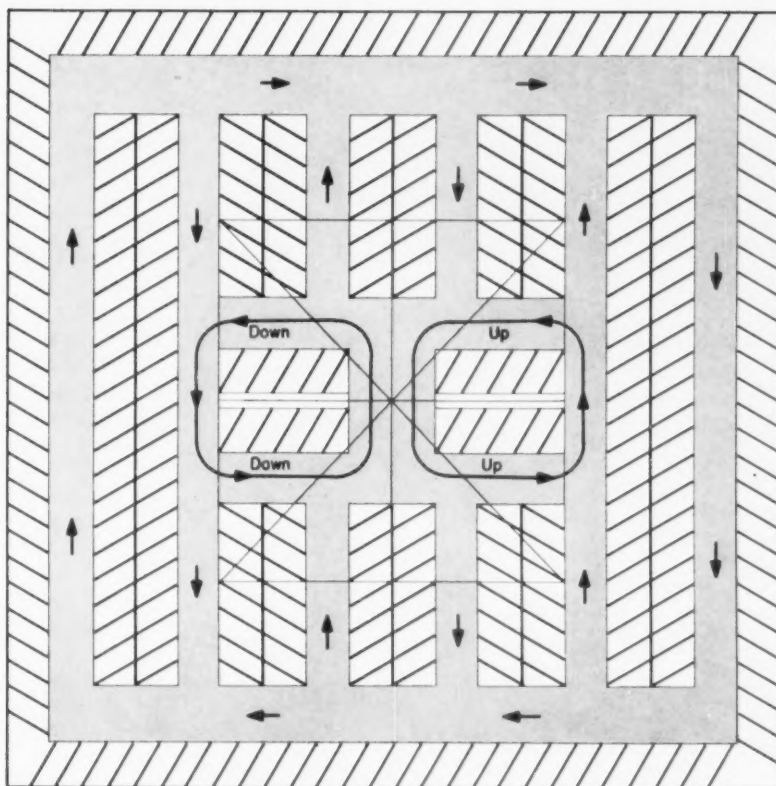
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PLAN VIEW OF DESIGN FOR A
 WARPED DECK PARKING GARAGE
 THAT ELIMINATES EXTERIOR
 FLOOR TO FLOOR TRAFFIC
 RAMPS. PERIMETER OF EACH
 FLOOR IS LEVEL.

Design for a Warped Deck Garage

E. M. KHOURY

E. M. Khoury & Associates
 Consulting Engineers

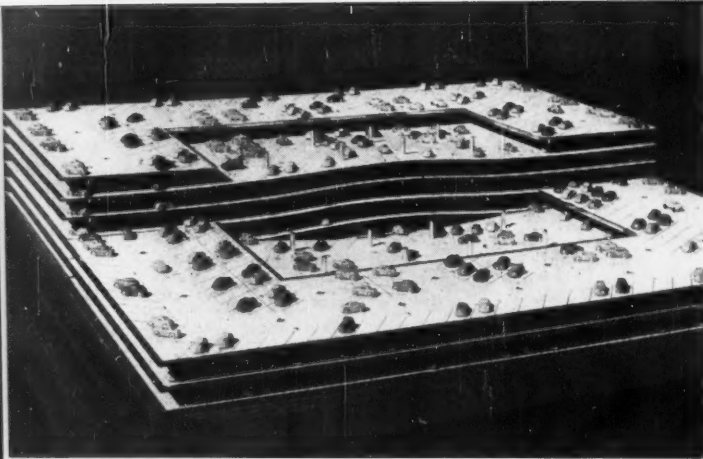
E. M. Khoury received a B.S. degree in civil engineering from Northeastern University, Boston, Mass., in 1943. He attended the Graduate School of Engineering at Harvard University, where he received an M.S. degree in Civil engineering in 1947. Prior to entering private engineering practice, Mr. Khoury worked in Chicago, Dallas, Boston, and Los Angeles as an engineer. He has been in private practice for about three years in Dallas, Texas and Los Angeles, Calif. He is a member of The American Society of Civil Engineers and is licensed in California, Nevada, and Texas. He has applied for a patent on the warped deck parking garage design described in this article.

THE DOWNTOWN PARKING PROBLEM has been attacked by city officials and private builders of office and commercial buildings. Many large cities, notably Chicago and Detroit, have invested in major municipal garage projects, usually financed by bond issues. About 50 other cities have adopted ordinances requiring that parking facilities be made a part of all new downtown stores, theaters, apartment houses, or other buildings used by large numbers of people.

A New Design Concept

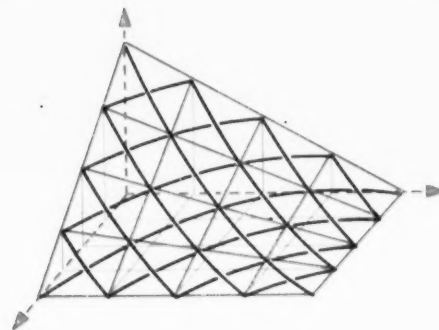
As any downtown motorist can testify, these measures are only partial solutions, and many billions of dollars still will have to be spent to provide parking space for the rapidly rising number of motor vehicles. Only by major investment can we hope to solve this problem that strangles the growth of the downtown areas of our cities.

While there have been some good designs developed for large multistory garages these have not involved any really new ideas. Basically, engineers



A MODEL OF A MULTISTORY PARKING GARAGE SHOWING ARRANGEMENT OF THE WARPED DECKS.

WARPED SURFACE, A HYPERBOLIC PARABOLOID, IS ACTUALLY A STRAIGHT LINE CONSTRUCTION.



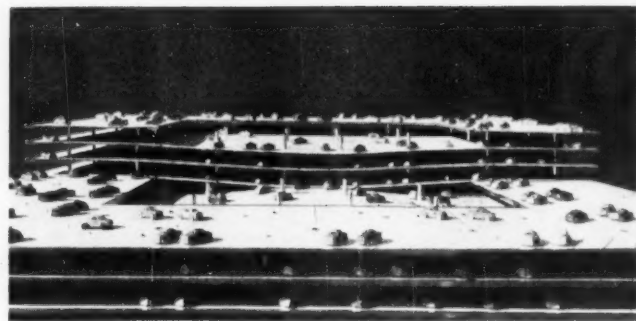
have stuck to the concept of a ramp roadway rising from one floor to the next, with flat parking areas.

Now, after many months of study of the problem, we think we have come up with a design that is a considerable improvement over the conventional. It not only provides approximately five percent more parking space for the same floor area, but it is excellently suited for use in connection with office or commercial buildings.

A Big City Design

This warped deck design is intended primarily as a big city garage covering a full block. An office or commercial building could project upward from the center. It is obvious that horizontal lines on all sides of the structure are preferable, and this warped design makes this possible, for there are no ramps around the exterior. The warping of the interior floors, clearly seen in the illustrations, permits level perimeter parking on all four sides. It is also possible to confine parking to the warped interior area and devote as much space as desired to offices around the exterior. By use of this design, the building can be thought of as a perimeter area of offices with desk-side parking in the area that normally would be an interior court. The horizontal lines of the exterior would blend with the surrounding architecture of the city.

This warped deck design makes use of two elliptical travel lanes, one for driving up, the other for going down. As shown in the illustrations, there are parking spaces between these travel lines so



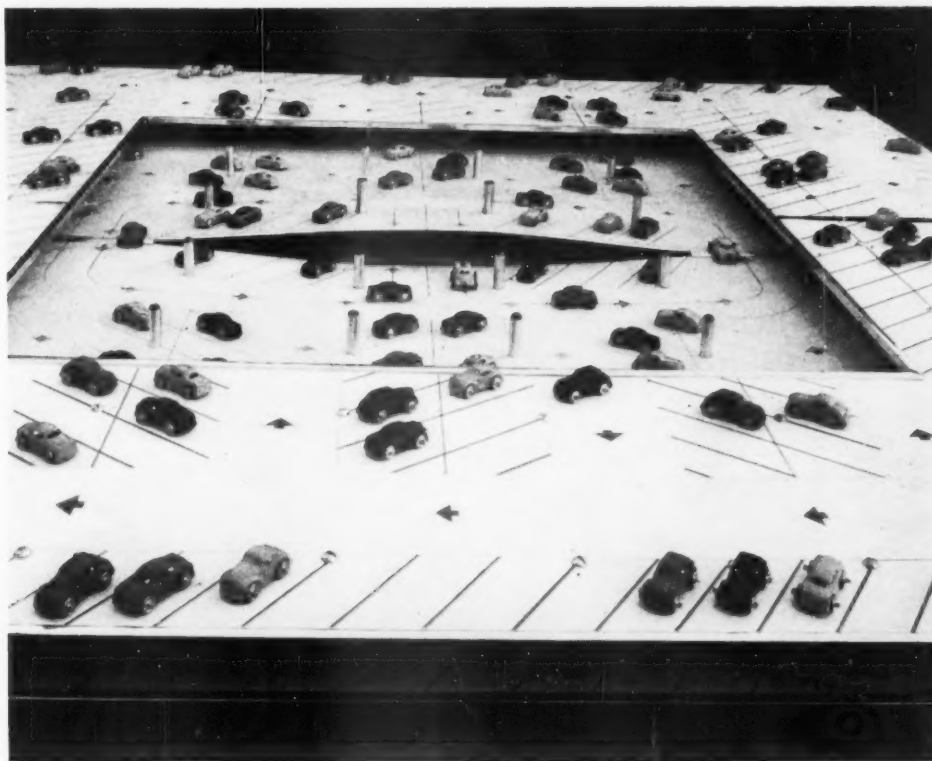
NOTE THAT EACH DECK IS EXACTLY THE SAME DISTANCE ABOVE FLOOR BELOW AT ANY POINT.

that a number of cars can be parked up against the division of the half section.

The elliptical travel curve is made as large as possible, for the larger this curve, the less the grade. This curve travels around a central escalator walk and the shear walls. (Note the parking area provided inside the elliptical curve.) If this design were spread over a full block, it would be easy for motorists to make the gradual turns with ease and park their cars without assistance. When an end turn is completed, there is a straightaway for about 50 feet before another turn starts.

Engineering Design

This type of structural design is much simpler than it looks. It is nothing more than a hyperbolic paraboloid, used in recent years in many thin shell structures. Despite its curved appearance, it is



WARPED DECK IS USED ONLY IN CENTER, PERMITTING LEVEL PERIMETER PARKING ON SIDES.

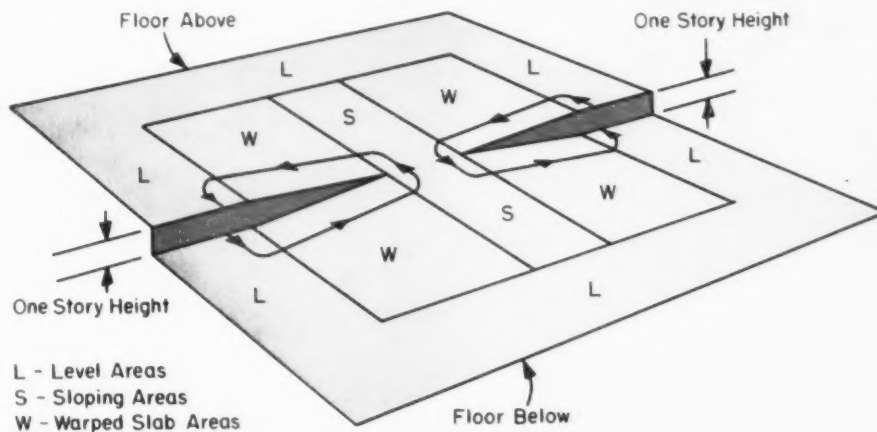
made up of straight lines in two directions (see sketch). Once the first deck is in place, the warped decks above are as easy to construct as any horizontal floor system. Each deck is exactly the same distance above the floor below at any point. And since these warped decks are made up of straight lines, they can be constructed of either steel or reinforced concrete.

The division line between the half sections is a convenient location for a shear wall for part of its

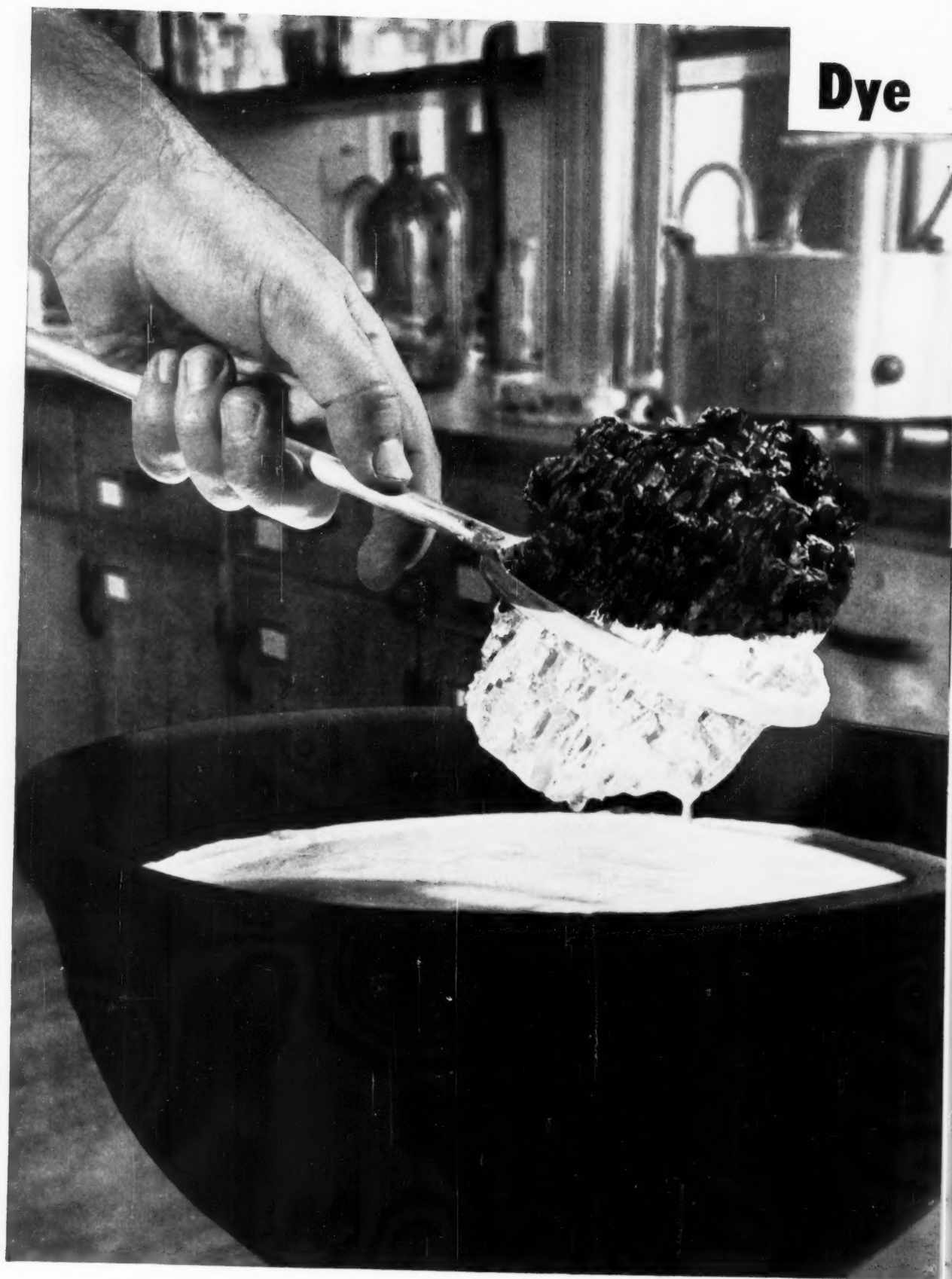
length to help resist lateral loads. This wall does not interfere in any way with the parking plan. This division line also makes an excellent location for escalators giving the public access to and exit from the upper floors.

It can be seen that this design combines the floor with the ramp, eliminating the construction of these two as separate structural elements. Instead, the warped deck design reduces the construction to one operation. ▲▲

UP AND DOWN LANES ARE ELLIPTICAL IN SHAPE WITH SEPARATE LANES FOR THE UP AND DOWN TRAFFIC.



Dye



maker brightens fuel cost picture

**Burning coal at Toms River-Cincinnati saves 20%
on fuel costs, permits clean steam generation**

The Toms River-Cincinnati Chemical Corp. plant in Toms River, N.J. is the most modern plant of its kind in the world. Producing vat dyestuffs requires a large dependable steam supply for chemical processes and heating purposes. To fill these requirements, the power plant at Toms River-Cincinnati is as up-to-date and efficient as the general plant itself. The fuel used for steam generation is coal because, on the basis of cost per thousand pounds of steam, the nearest competitive fuel costs 20% more than coal. In addition, thanks to automatic operation and modern equipment, the power plant meets the rigid standards of cleanliness required in such manufacturing operations.

Facts you should know about coal

Not only is bituminous coal the lowest-cost fuel in most industrial areas, as in the case of Toms River-Cincinnati, but up-to-date coal burning equipment can give you 10% to 40% more steam per dollar. Today's automatic equipment pares labor costs and eliminates smoke problems. And vast coal reserves plus mechanized production methods mean a constantly plentiful supply of coal at stable prices.

Technical advisory service

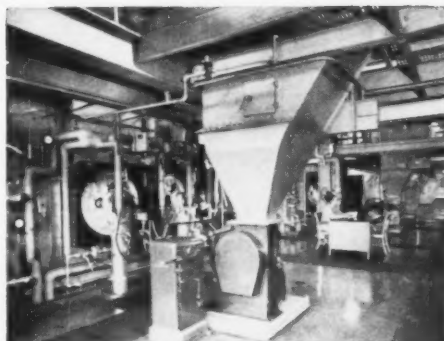
All companies planning a new power plant, or the remodeling of a present one, should consult an engineering firm on its design and construction. As a matter of fact, every Bituminous Coal Institute advertisement advises its readers to take this step. When you have such a project, our Engineering Staff will be glad to assist you in your fuel cost survey with any coal information you may require.

Meanwhile, we believe you will be interested in our informative case history booklet, complete with data sheets. Write to the address below for your copy.

**BITUMINOUS
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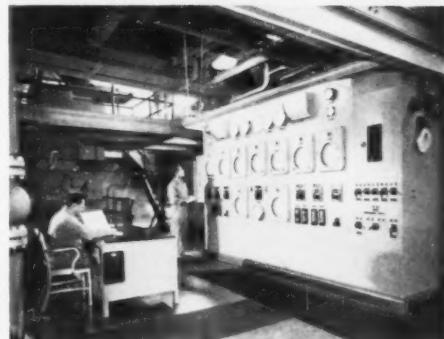
View of boiler room showing both 50,000 lbs. hr. boilers, by Riley Stoker Corp. Each has two burners. Center foreground is automatic weigh scale, by Richardson Scale Co., which receives coal through hopper from live storage bin and passes it to coal feeder. Coal is fed to Riley Pulverizer in basement, then blown back up to burners.



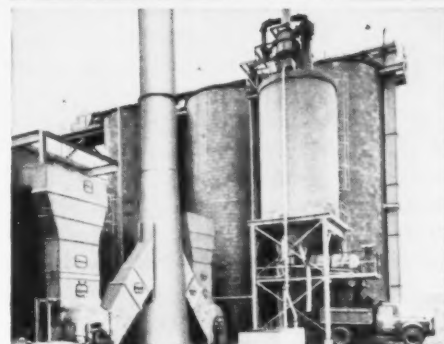
Close-up of Gifford-Wood Roundabout Bucket Conveyor beneath coal storage silos. Transversing feeder-car is used when coal is emptied from silo and conveyed to live storage bin.



Automatic combustion control and instrument panel by Bailey Meter Co.



Fly ash being loaded on truck through a dustless rotary unloader. Fly ash is collected by Prat-Daniel Mechanical Precipitators. A pneumatic ash collecting system by United Conveyor (with tie-ins under air heater and at base of stack) removes it to this 20-ton ash silo. In the rear are three 330-ton coal silos.





Good Catalogs . . . How Consultants Use Them

A REPORT FROM THE COMMITTEE OF ONE-HUNDRED. Manufacturers and suppliers are conscious of the need to produce catalogs and bulletins that can be used by consulting engineers in their design work and in the writing of specifications. Many manufacturers do not seem to understand, however, just how the engineer uses catalogs, nor do they recognize the type of material that is most helpful to him.

Those most qualified to tell the manufacturers what is needed in a good catalog — and what is better left unsaid — are consulting engineers themselves. So *Consulting Engineer* asked the "Committee of One-Hundred" to submit opinions and suggestions that would help the manufacturers and their agencies do a better job in preparing engineering catalogs. Since it is the manufacturers, not our consulting engineer readers, who will benefit from this advice, we are publishing here only a brief resume of the Committee's Report. The full Report is being sent to about 2500 manufacturers and suppliers and their advertising agencies. Any reader interested in the full Report can get a copy by writing to the Editors.

The "Committee of One-Hundred" is made up of prominent engineers from all parts of the country, representing all sizes of firms and fields of specialization. This summary and the Report on which it is based is a composite of their thinking as men in private practice. It is not the opinion of any one man on the Committee, but all of them agree with most of it, and most agree with all.

ACCORDING TO the Committee of One-Hundred, somewhere between a half and two-thirds of the catalogs received in the mail or directly from salesmen are filed in the wastebasket. This is because too many catalogs contain more sales story than pertinent technical data. The consulting engineer does not want the two combined.

Some manufacturers seem to have a tendency to include not only promotional material but also maintenance and operation manuals and perhaps histories of their companies or detailed reports of the preliminary research required for development of their product. Most of this is superfluous from

the consulting engineer's point of view. His primary concern is preparing specifications for his client.

Contents of a Good Catalog

A good catalog should contain, as a minimum:

- ' A brief description of the product, pointing out its special features or characteristics.
- ' Complete technical data including ratings and detailed dimensions.
- ' Clear statements as to the product's limitations as well as its proper applications.
- ' Prices wherever possible.

Generally speaking, consulting engineers prefer tabular data to charts, and prefer charts to formu-

las. Some charts are quite useful, but they are seldom as easy to read or as accurate as tabular data. Formulas should be avoided except when absolutely essential.

The Committee emphasized most strongly the need for adequate dimensional drawings. It seems that the majority of manufacturers fail to put all of the dimensions required on their product drawings, and they frequently forget to show required clearances. Nothing is more frustrating to the engineer than to find missing from the catalog drawing one of the dimensions he needs.

The engineer also likes to have complete information on the physical and chemical properties of all materials and complete ratings on all equipment. This is particularly important in connection with new products.

Types and Bindings

Even the best catalog data can be spoiled by presenting it improperly. Engineers prefer standard 8½ x 11 inch catalogs and bulletins. If the company issues separate small bulletins on each of its products, these should be punched so that they can be inserted in 3-ring binders. Large general catalogs are quite satisfactory except that too many of them are bound in such a way that they cannot be made to open flat on a desk. Move away from them and they automatically close up. One member of the Committee called attention to a particular manufacturer's catalog that could be closed properly only by holding it overhead and shaking it.

Distribution

Catalogs do not serve their purpose unless they get into the right hands and are filed properly. Some engineers prefer that catalogs be sent through the mails, while others like to have the sales representative call and insert the new pages and take the old ones out. Whichever way it is done, the objective is to make sure that all catalogs are properly arranged and current.

An Engineers' Index

One of the major problems in connection with catalogs is entirely up to the engineer to solve. He must find some way to file them so that they can be located easily when needed. Perhaps a third of the engineers' offices make use of the AIA Index System or some adaptation of it. Other offices have devised some sort of system of their own. Almost no one has a filing system with which they are completely satisfied. Engineers agree almost unanimously that there is an urgent need for a standard filing system designed specifically for their own use. There is no objection to the basic idea of the AIA system—on the contrary it is thoroughly liked. The trouble is that it needs considerable abbreviation in some sections and enormous expansion in

others to suit the needs of consulting engineers. The Consulting Engineers Council and the Producers' Council (who worked with AIA in the preparation of their Index) have a committee currently working on the development of an Engineers' Index. It may, however, be several years before this is ready for general use.

Even a well devised index interchangeable with the AIA numbering system has its drawbacks. General catalogs containing data on many different and varied types of equipment will not fit into that type of filing system. These must be cross-indexed and tabbed with index numbers for each product type described. This is a major job for an engineering office librarian. However, the AIA type system works excellently for the filing of catalog sheets and bulletins dealing with one type of equipment or one type of material.

The indexing situation being in such a sad state currently, most engineers prefer well bound general catalogs with replaceable pages. However, they agree that if and when a good Engineering Index is developed, they would prefer separate bulletins for each product.

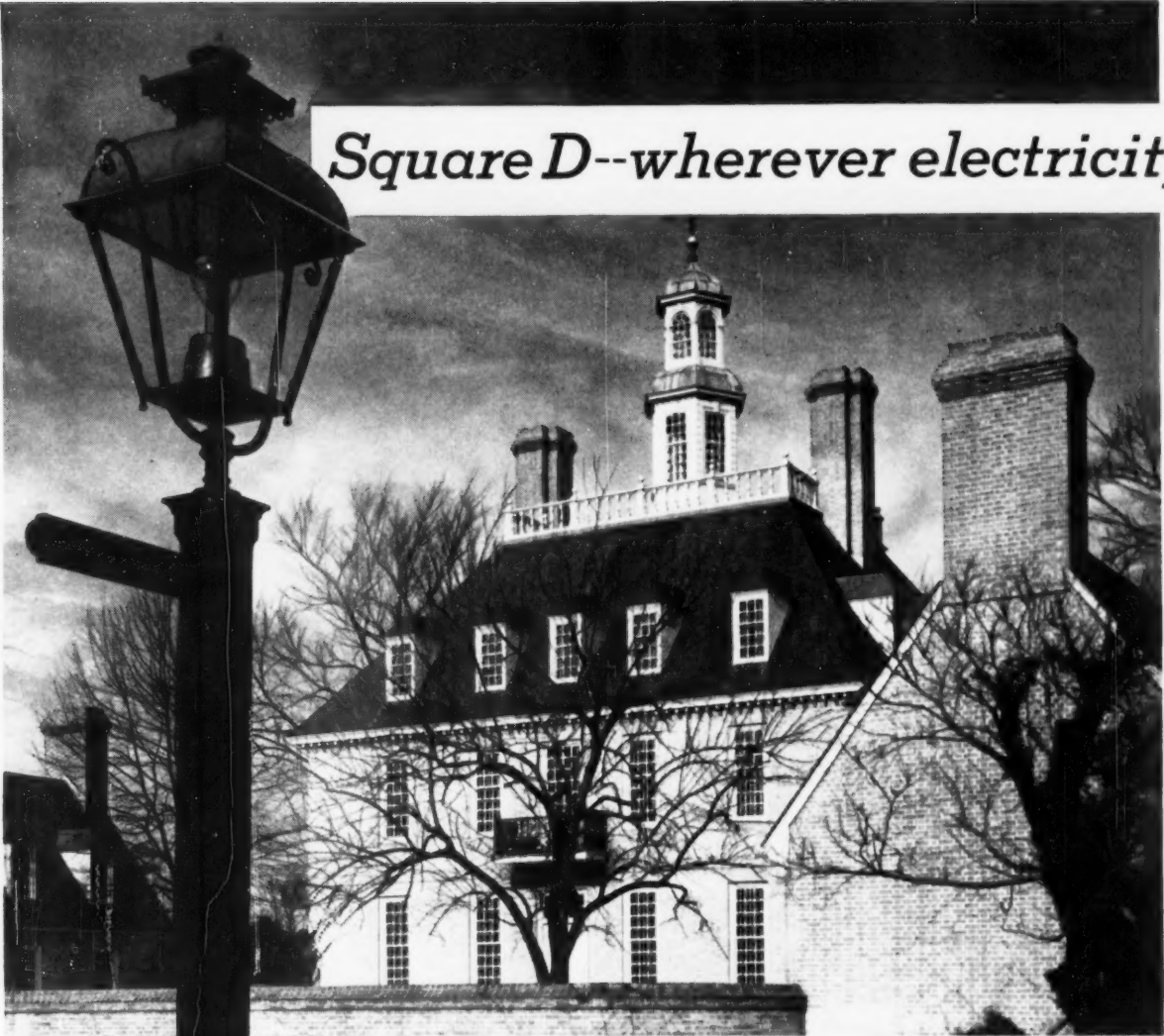
Physical Arrangement

The amount of space given catalog files differs according to the size of the office and the fields in which the engineer practices, but a reasonable figure is about 40 feet of shelf space and 10 to 20 standard file cabinet drawers. This space could be considered almost a minimum, for very few engineer's offices have less, while many large offices have large library rooms of catalogs.

Most of the large offices and many of the smaller ones have some sort of check-out system for catalogs. When there is no regular librarian, the engineer taking the catalog from the central file to his own desk simply writes his name on a small card below the name of the bulletin or catalog removed. Larger firms use a regular library type check-out system.

Consulting engineers feel that their catalog files are in fair to poor shape. This can be corrected only by assigning more technical employees to selecting catalogs and maintaining the catalog library—and by the general adoption of a satisfactory standard indexing system for engineers.

Engineers, as might be expected, prefer catalogs in which specification data is referred to as "engineering data." They strongly object to bulletins in which all the technical material is labeled "architects' data." The consulting engineer is particularly offended when the manufacturer addresses himself to architects in connection with products that are obviously within the specification area of engineers. However, the engineer will forgive this if the manufacturers will make a real effort to provide better technical information. ▲▲



Square D--wherever electricity

**NOW IT'S AN EVEN GREATER EXPERIENCE
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MORE THAN eight million people have visited this enchanting Virginia spot where the course of early American history was charted. Now, through the facilities of Colonial Williamsburg's new Information Center (*opposite page*), guests are provided with every conceivable

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Report from Germany

GAULT MacGOWAN & FRED C. BOLTON
CONSULTING ENGINEER CORRESPONDENTS

Members of the *Verein* have their offices all over the Federal Republic, with largest representation in West-Berlin, Dusseldorf, Essen, Hamburg, Hannover, Cologne and Munich. They also are engaged in all phases of private practice, some highly specialized and some engaging in general design and supervision of construction for all phases of *Bauwesen*, or building trade.

Titles and Degrees

Regardless of membership in the VBI, the members of the consulting profession generally are regarded as having superior training and experience. Almost all have advanced degrees in engineering. A degree is of utmost importance in Germany's social hierarchy. This is illustrated by the prevalent practice of a wife being addressed with the title of her husband. A Frau Ing. Schmidt rates high, a Frau Dr. Ing. Schmidt very high, and a Frau Prof. Dr. Schmidt at the pinnacle. This old practice is slowly fading out in bustling modern-day Germany, but it still lingers and still acts as an open sesame.

Naturally the doctorate represents the highest training and technical qualification. Just below that, and generally accepted as the normal engineering degree, is the *Diplom-Ingenieur*. This provides a level of training comparable to the five-year graduate from an American engineering college. It includes at least three years study at one of the universities on top of the thorough academic education of a *Gymnasium*, or high school-junior college.

Trade schools occupy a larger position in the engineering profession in Germany than in the States. They provide the great mass of draftsmen, foremen, junior engineers, and other skilled but nonprofessional men required in industry. This sharp grading limits opportunities for advancement, but avoids the spectacle of a graduate engineer doing the work of a technician.

Independent advice is the German consulting engineer's unique contribution to the economy of the country. In so highly organized a country, it is

GERMANY'S *Wirtschaftswunder*, her tremendous economic recovery from the destruction of World War II, is due in no small part to the 265,000 professional men who have engineered the rebuilding. These men are justly proud of what they have been able to do. This pride is shared by the nation, which looks upon its engineers in a way approaching hero-worship.

Approximately 2400 engineers are in private practice, but it is difficult to determine exactly how many consulting engineers there are in the country, for there is no state registration of the profession. This is contrary to the general European practice. In Germany anyone who so chooses may set up an office, call himself a consulting engineer, and offer his services to the public.

Consulting Engineers Association

Over 700 engineers in private practice are members of the Association of Consulting Engineers, the *Verein Beratender Ingenieure e.v.*, (VBI). This organization has been deeply concerned with maintaining professional standards since its formation in 1903. To become a member of the VBI an engineer must have at least six years of engineering experience. One year must have been actual consulting work. Thus the organization sets high standards which are recognized throughout the country.



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frequently difficult to secure unbiased opinions. When a firm calls in a consulting engineer, however, it can be sure that it will obtain advice totally unprejudiced by the highly organized and interrelated dealings of the big companies. The VBI feels that its members should have with their clients the relationship of a lawyer or an accountant—divorced from bias, and serving the honest interests of the client in a professional manner.

Another important service of the VBI engineer is the personal touch and consistent follow-through for the client. Again the high degree of organization in the general economy makes this service unique. The consulting engineer takes pride in knowing his client personally and in always being available to help. For this reason most of the independent consulting firms tend to remain smaller than construction or man-

ufacturing firms, on the assumption that size eliminates the personal touch.

Economic policies of the Adenauer government since the war have had a marked influence on the growth of the consulting profession. The vigorously executed concepts of a free market and a free economy, totally unknown to prewar Germany, have greatly encouraged the individual who wants to go on his own. While the big companies have become bigger, the small independent firm, particularly in a service profession, has profited tremendously.

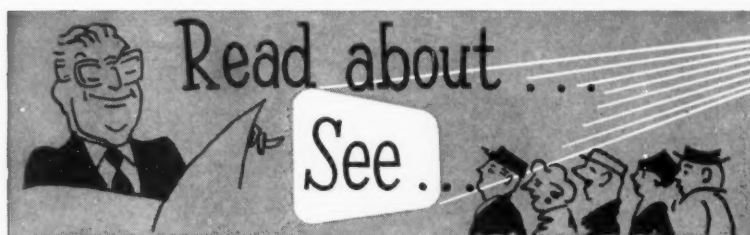
Government Contracts

One direct effect of this free economy policy is on the amount of work that the consulting engineer does for the government on a contract basis. The federal practice of employing private concerns instead of organizing an agency has been followed by state and city governments. Through this policy countless contracts, ranging from the design of a simple heating installation to a vast housing project, have been awarded to private consulting firms.

A consulting engineer is actually more likely to be called in for government jobs because of his reputation for independence and experience built up through the last decade. Activities of the VBI frequently are channeled towards spreading this reputation and seeing that their members share in the government contracts being awarded every day.

Where complete independence is essential—such as in conflicts between government and private organizations, in examinations of applicants for technical positions, or in inspection of public work projects—the VBI man almost always is employed.

Germany's *Wirtschaftswunder* has naturally brought personal wealth to many persons. The consulting engineer has earned his share. Almost all consulting engineers live in handsome new homes and drive either Mercedes



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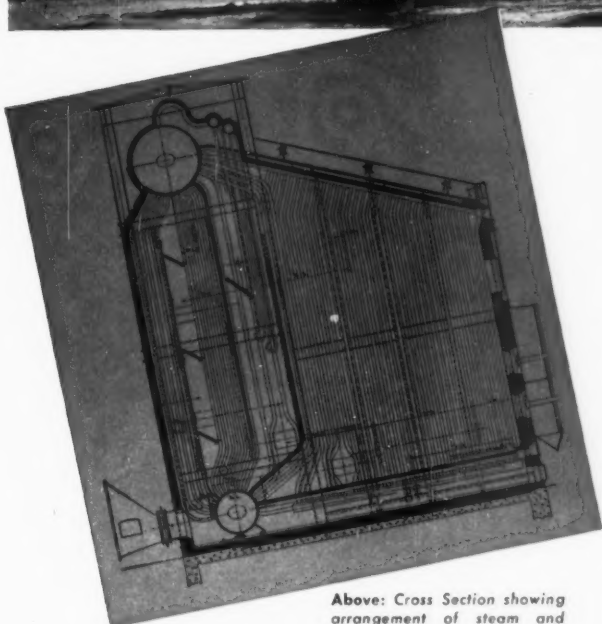


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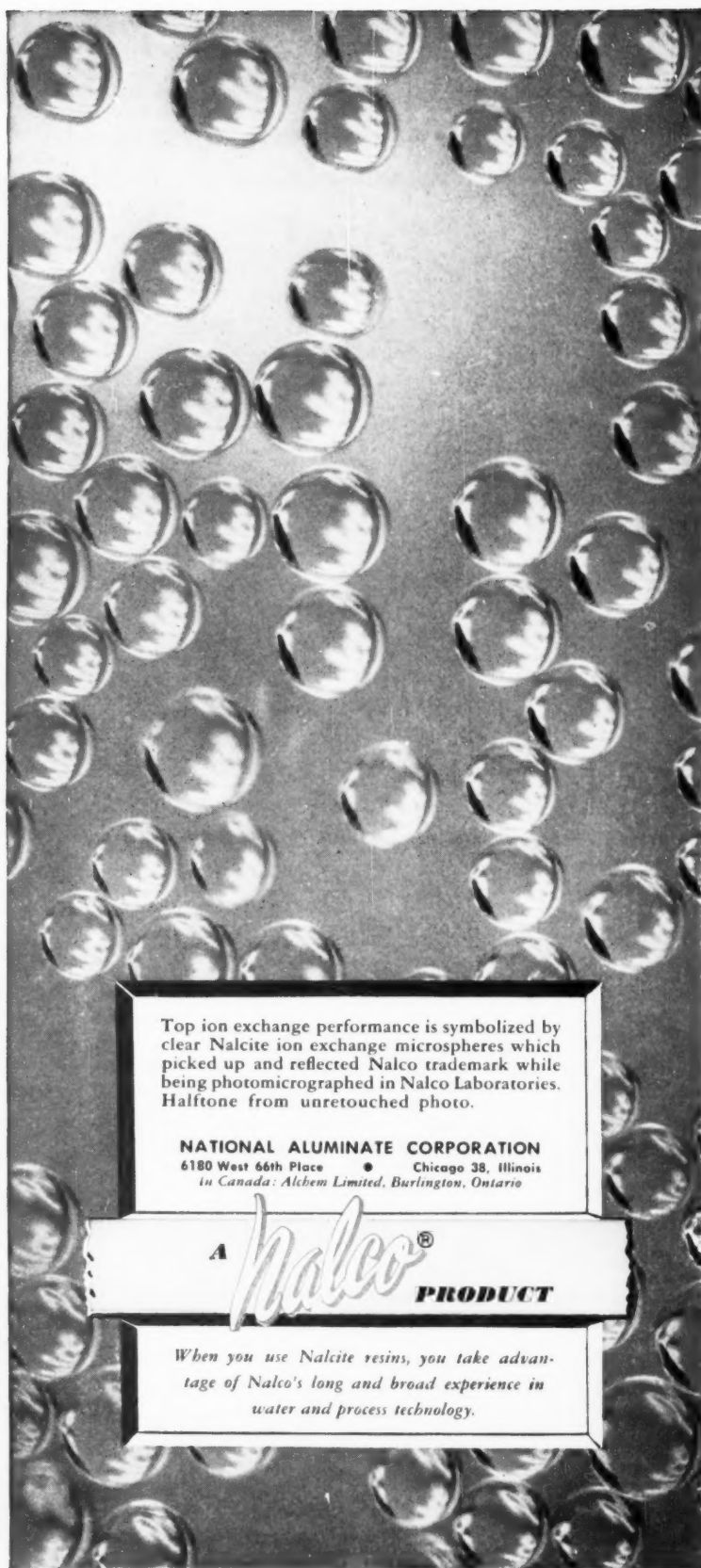
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Engineering Fees

Fees charged by consulting engineers are those set by the GOI (*Gebuehren-Ordnung der Ingenieure*). The schedule has been published as a result of committee work representing all organizations associated with engineering work. This slim little book is the bible of the profession. Its use guarantees fairly uniform charges throughout the country.

Services are divided into three general classes according to the difficulty of the work involved. For a job involving less than 10,000 DM (approximately \$2400), engineering fees may run from 5 to 12 percent. Quite naturally, the higher the total cost the lower the fee percentage, but engineering charges never run less than 2 percent of the total project cost. To keep charges within reasonable limits on small projects, many consultants apply the hourly rate of 12 DM (\$2.90) with a minimum of 25 DM (\$6.00).

Reconstruction

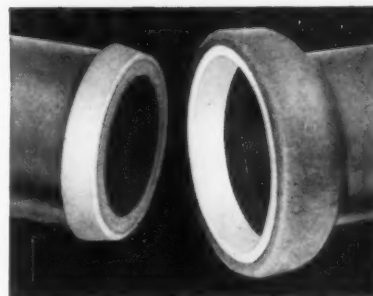
Rebuilding Germany is not complete. Every city still shows scars of the war, and there are empty lots where large buildings should stand. German consulting engineers are optimistic about their economic future, but clearly realize that the future depends on continued peace and freedom. The shadow of the Iron Curtain never leaves this land, but the German engineer is acutely conscious of the meaning of freedom, and if given the political opportunity, he will make an even greater economic contribution to the development of the country than he has in the past. ▲▲

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Report From The East Coast

STAFF

Fees and contracts, of the General Services Administration and the Department of Defense, have come under scrutiny of the Consulting Engineers Council and *CONSULTING ENGINEER* magazine.

In recent interviews, Leonard L. Hunter, assistant commissioner for design and construction, General Services Administration; and Max Barth, chief of the technical division, office of the director of construction for the Assistant Secretary, Department of Defense, (properties and installations) not only were asked about how their offices dealt with consulting engineers but — much more to the point — “Why.”

Interview with GSA

Hunter, in an interview with *CONSULTING ENGINEER*, answered all questions.

First, an explanation of the responsibilities of Hunter's office. The Public Buildings Service, his office, is responsible to the GSA for all buildings, both federally owned and leased, (except on military or special service reservations) in which are provided housing accommodations for government activities. He has 10 regional offices — in Boston, New York City, Washington, Atlanta, Chicago, Kansas City, Dallas, Denver, San Francisco, and Seattle.

Hunter, a member of the American Institute of Architects, referred throughout most of the conversation, to the “architects” although he did mention that in some instances his office deals with the consulting engineer. These instances, he explained, are on projects involving such things as air-conditioning of an existing building, sewers, and similar problems involving only engineering.

“I still think the major service on a building is architectural,” he added.

Professional services for GSA projects usually are retained on a lump sum fee basis. This fee is based by the General Services Administration on their own estimate of the cost of the project.

The Consulting Engineers Council complained that on many projects, the original estimated cost is unrealistic.

In one instance, which came to the attention of *CONSULTING ENGINEER*, the original estimate missed the final costs by a sizeable margin — \$1 million.

Legal Fee Limit

In his explanation of the fee system, Hunter mentioned that the GSA is limited, by law, to a 6 percent maximum fee for professional services. The law he referred to is Section 304 (b) of the Federal Property and Administrative Services Act of 1949, as amended Public Buildings Act of 1949.

This law states:

“The cost-plus-a-percentage-of-cost system of contracting shall not be used, and in the case of a cost-plus-a-fixed-fee contract the fee shall not exceed 10 percentum of the estimated cost of the contract, exclusive of the fee, as determined by the agency head at the time of entering into such contract (except that a fee not in excess of 15 percentum of such estimated cost is authorized in any such contract for experimental, developmental, or research work and that a fee inclusive of the contractor's costs and not in excess of 6 percentum of the estimated cost, exclusive of fees, as determined by the agency head at the time of entering into the contract, of the project to which such fee is applicable is authorized in contracts for architectural or engineering services relating to any public works or utility project). Neither a cost nor a cost-plus-a-fixed-fee contract nor an incentive-type contract shall be used unless the agency head determines that such method of contracting is likely to be less costly than other methods or that it is impractical to secure property or services of the kind or quality required without the use of a cost or cost-plus-a-fixed-fee contract or an incentive-type contract. All cost and cost-plus-a-

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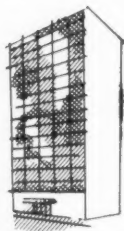
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fixed-fee contracts shall provide for advance notification by the contractor to the procuring agency of any subcontract thereunder on a cost-plus-a-fixed-fee basis and of any fixed-price subcontract thereunder on a cost-plus-a-fixed-fee basis and of any fixed-price subcontract or purchase order which exceeds in dollar amount either \$25,000 or 5 percentum of the total estimated cost of the prime contract; and a procuring agency, through any authorized representative thereof, shall have the right to inspect the plans and to audit the books and records of any prime contractor or subcontractor engaged in the performance of a cost or cost-plus-a-fixed-fee contract."

Architect Pays Engineer

Hunter said his office does not expect architects to furnish the engineering services on a project, but they do expect the architect to take care of compensating any engineer who works with him. The GSA checks the experience record of the engineer who is selected by the architect. And Hunter's office has no information on what fees architects pay consultants.

When he was asked if he considered it fair to pay the entire fee to the architect, and let the engineer manage the best way he can, Hunter said, "I thought an engineer was as smart as an architect. If he will let an architect beat him over the head on fees, then he deserves what he gets.

Current Fee Adequate

"The 6 percent maximum fee hasn't hurt us at all to date," Hunter stated, adding that he considers the fee adequate. After all, he explained, any engineer working on a GSA project gets more provided to begin with than he does on a nongovernment project. He is given a complete program, topographical surveys and soils studies, and pay above the six percent for supervision.

As for estimated project costs being unreasonable, Hunter said

the engineer has an opportunity to study the estimate as much as he wants to before taking a project. If he does not agree with the estimated costs, he can speak up at that time.

"Once you agree to this estimate, you're stuck with it." . . . That is, unless the scope of the project is changed, and then the GSA is willing to renegotiate. Hunter said that by "scope" he means something like adding a cafeteria to what originally was to be "just a straight office building." But he added that this seldom happens. "These are no fly-by-night deals."

Competitive Bidding

Hunter was questioned, by both the Council representatives and by CONSULTING ENGINEER, about competitive bidding.

"I have never judged a professional man by any except professional standards," he said. And he does not expect anybody to do a job for nothing. "I expect him to make a reasonable profit."

Up to two or three years ago, GSA had all design work except for major new construction projects done by government employees. Hunter said that dealing with professional architects and engineers was new to the regional people, and some did not know the proper way of going about it. "It was just a matter of education, and I think some of the stories of GSA competitive bidding date back to the transitional days."

Order to GSA Offices

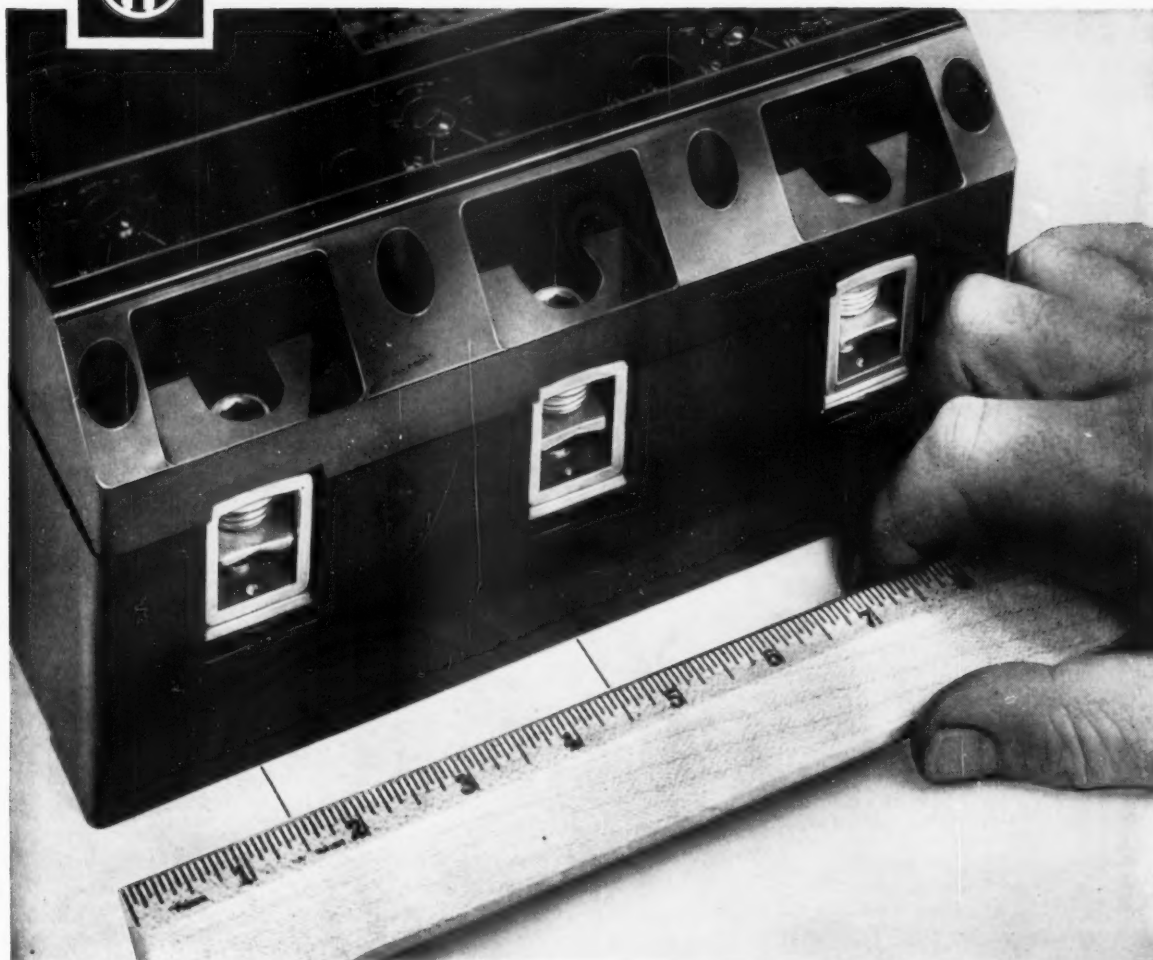
He also issued an order to all GSA offices strictly forbidding the letting of professional contracts by competitive bidding. A copy of this order, sent to CONSULTING ENGINEER, states that:

"The selection of architects and engineers for professional services should be made from evaluations on the basis of answers given on questionnaire forms, on exhibits submitted, and on other pertinent information.

"In no instance should firms or individuals be requested to state



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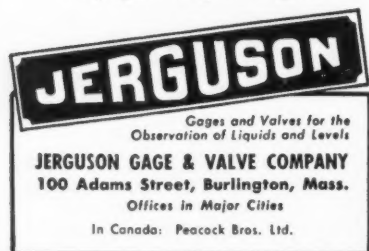
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the minimum fee prior to negotiation of contract."

On the Council's visit to Hunter, Edward J. Wolff, Council president, brought to Hunter's attention a specific case in which competitive bids from architects had been solicited by a GSA regional office.

Hunter admitted that one or two similar cases have been brought to his attention, and that his office is making every endeavor to eliminate bid solicitation. He told **CONSULTING ENGINEER** that if any consultant hears of specific cases of competitive bidding being sought by the GSA, he would like to know about them.

But he added one plea — anyone who is going to send him documented cases of government officials and competitive bidding should be sure that cases involve the GSA. "Otherwise, I'll be getting a lot of mail."

How Engineers are Selected

How does the GSA select architects and engineers?

Until a few years ago, all architects and engineers for GSA projects were selected by the Washington office. When the work load increased, the selection was passed on to the regional offices in some instances.

Now, the Washington office selects architects or engineers for all new construction, wherever located. For all special purpose structures, professional persons are chosen on a basis of specialized experience. On projects of a national character, in the District of Columbia, the architects or engineers can come from any part of the nation. On projects of a general character, they are chosen from the state in which the project is located.

Regional offices help to select architects and engineers for "repair and improvement projects."

Circulars Sent

For all projects of less than \$200,000 the regional offices send circulars to architects or engi-

neers within the area. The names are selected from the state's registration list and from an area surrounding the project. The names are evaluated and placed in the regional files.

On projects valued at \$200,000 to \$500,000 the regional offices send descriptive circulars to regional architects or engineers and then make recommendations to the GSA in Washington. On projects of \$500,000 or more the regional offices merely circularize the architects or engineers in their files and report their findings to the GSA.

These files, of eligible engineers and architects, are by no means closed. Anyone wishing to be considered for GSA projects has only to go to the nearest GSA office and fill out a questionnaire, which later is evaluated and placed in the permanent files.

Is Politics Involved?

Do political considerations have a place in this selection?

At this, Hunter came to life. He explained that regional offices are run by civil service employees, who have no more interest in politics than does the GSA office.

"And I'm so happy about the freedom my office has that it scares me."

Why does not GSA work with national organizations, such as the Consulting Engineer Council, to obtain the names of professionals for the engineering file?

"I pay no attention to societies. Membership doesn't prove a thing," the AIA member stated.

Defense Department

Barth, whose office is centrally located in the Pentagon maze, also was quizzed as to the fees and contracts habits of his office in the Department of Defense.

Among the responsibilities of his office are the establishment of criteria for the design, construction, and maintenance of military projects, including family housing. Only in rare instances are contracts actually let from Barth's

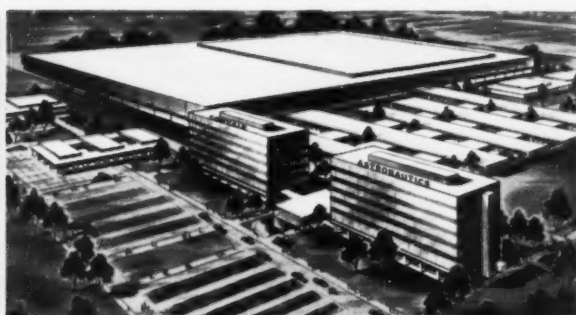
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office and these only for design and investigation.

Prior to the meeting with Barth, the Council's fees and contracts committee circulated a questionnaire regarding fee and contract practices of the Armed Forces. Barth was given a copy of the questionnaire results, copies of which he distributed to the Chief of Engineers, the Bureau of Yards and Docks, and to the Air Force. He said that he now is ready to meet with Council representatives again (and will have done so by the time this is published) to discuss the reactions to the survey.

Secret Fee Curve

Foremost on the agenda with Barth was a discussion of the "secret" fee curves under which the Department of Defense grants contracts.

Barth said he has gone to considerable trouble to assemble information on this, which he plans to discuss with Consulting Engineers Council representatives.

This fee curve is labeled "for official use only." Barth explained that at one time it had the familiar Washington "classified" listing, but since security was not involved, his office had the curves reclassified.

Barth then was asked what he would do if he received a request to remove the "official use only" from the fee curves. He said he would make his recommendations as to publicizing the fee curves, to the Director of Construction.

Then CONSULTING ENGINEER asked why the "classified" label could be changed to "official use only" by Barth's office, yet the next change would be more complicated. Barth explained that some study on the advisability of making the curves public would have to be done before any formal action could be taken.

Barth said that the Council's visit to his office was the first time a question of availability of the fee curves had been brought up.

However, he said that the engineer, when dealing with the De-

fense Department, is dealing with a client, and that the architects (he is an AIA member too) do not give their fee curves to engineers they engage.

Barth feels that at this time, the official sentiment is to keep the fee curves under their "official use only" listing. However, he said this sentiment could change. "If it serves the government's purpose, in the interest of society, the classification would be changed."

New Task Force

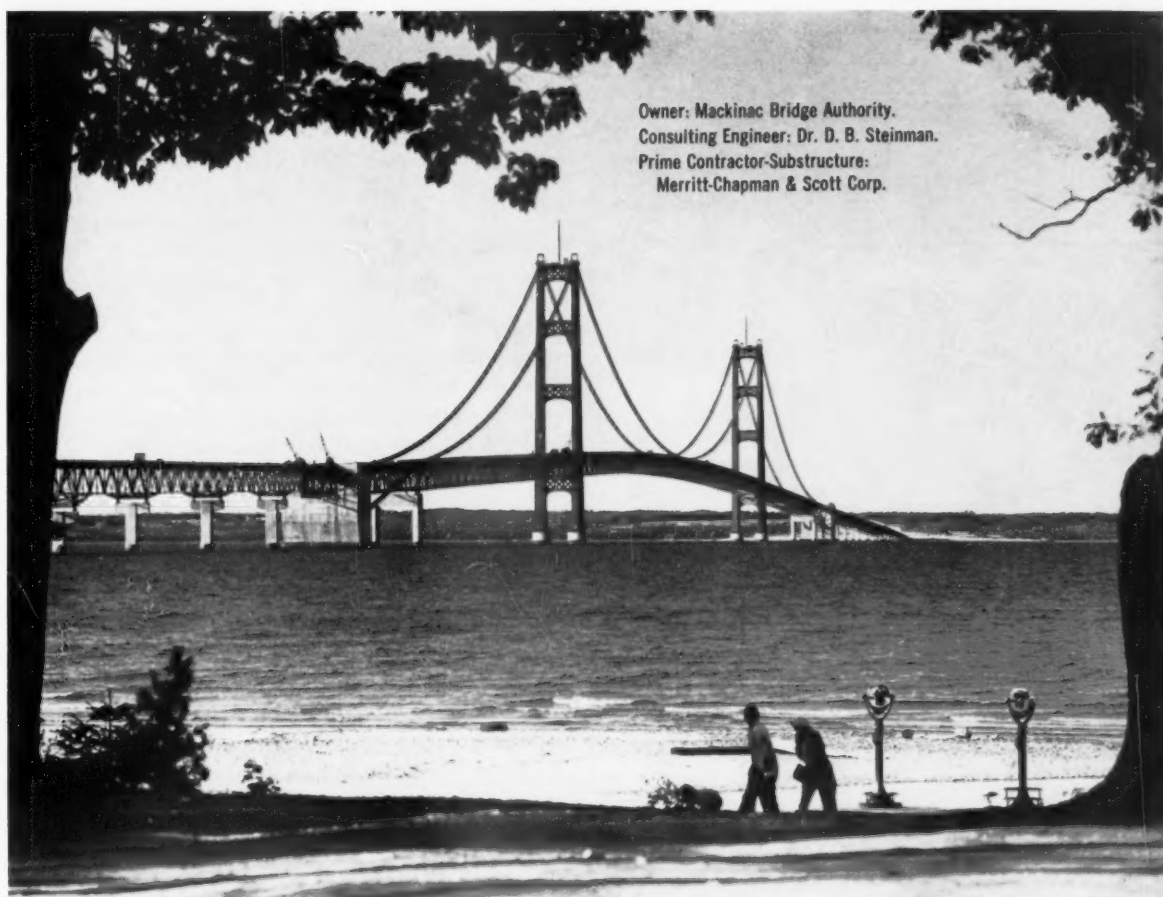
A Task Force for the Review of Government Policies and Procedures has been established (some time ago although they have only met once). This task force, which includes representatives of the Veterans Administration, the Atomic Energy Commission, the Commerce Department, the Defense Department, and the Small Business Administration, will include a discussion of professional fees on its agenda.

Barth's office also operates under a 6 percent maximum fee limitation on cost-plus-a-fixed-fee contracts. And only on the smallest projects, such as the remodeling of a hospital, has he ever had a complaint.

Fair and Reasonable

Barth does not think engineers and architects are unhappy about their fees. He pointed to the last paragraph of the Office of the Chief of Engineers architect-engineer information form. Any engineer getting a Defense Department contract signs a statement that "I certify that construction costs mutually agreed to in the amount of \$..... is fair and reasonable compensation for the services to be rendered under the proposed contract." During many years with the Corps of Engineers, Barth said he does not recall anyone who ever wanted to say the compensation was not fair and equitable.

Corps of Engineers files, like those at the GSA, also contain a long (5000) list of the names of



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sonnel, materiel and floating equipment.

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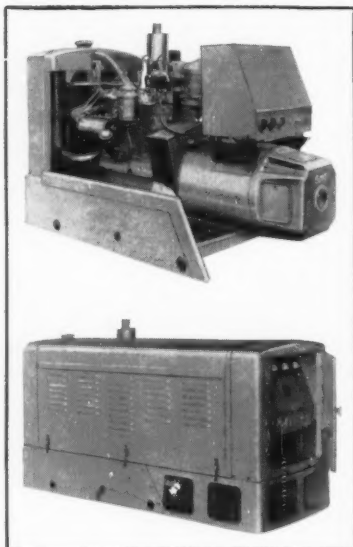
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architects and engineers. This is compiled from evaluation of regulation forms, which are available to any firm. And from this list professionals are chosen.

How Selection is Made

In the selection of an engineer, Barth said the department of defense judges by: (1) specialized experience, (2) capacity of the firm to get the project completed on time, (3) past experience, particularly in reference to defense contracts, (4) geographical area, and (5) volume of work previously awarded to the firm. ("We like to spread these things around.")

Politics also does not rear its ugly head in Barth's department. Barth said cases of "political engineering" (See CONSULTING ENGINEER, December) are like the criminal element — a tiny percentage of the whole, and Barth said he has never personally seen a case.

When asked about contracts awarded on "price per sheet," Barth said he preferred not to go into this. He added that this will be discussed by the Task Committee.

No Competitive Bidding

Is there any competitive bidding for professional services by the Defense Department?

"All fees are based on the work alone. There is no competitive bidding, and we have to assure the government of this. We want to retain the negotiation principle."

What about per diem fees?

Barth said that payment per hour, for engineers, is estimated and agreed on prior to and during negotiations. Estimates for any geographical area are based on the going rate in that area. "The fact that one engineer asks for a certain amount does not mean that the defense department would be justified in paying fantastic salaries. Most people, if they are honest, admit that they make a profit on defense contracts."

Barth added that the contracts are negotiated by professional

people who know what it takes to do a job.

Inadequate Per-Diem

The Defense Department pays a maximum of \$50 per day for site visits. Barth, in talking with the Council, agreed that the figure now is entirely inadequate as a per diem fee.

However, this figure is required by Section 601 of Public Law 117, 85th Congress. The law states that the Defense Department is authorized to procure services "at rates for individuals not in excess of \$50 per day under regulations prescribed by the Secretary of Defense."

In talking with the Council, Barth acknowledged comment that negotiation procedures are not uniform in different branches of the Armed Services, but he did not feel that uniformity would be a great advantage. The CEC committee disagreed, and felt that lack of uniformity, both in methods, negotiations, and in basis of determining fees, was disadvantageous and contrary to the principles of the Defense Department.

Disagreement

One of the principal differences of opinion between the members of the CEC and the Defense Department also is in the method by which fees are negotiated. The Defense Department appears to feel that in accordance with its policies, the various negotiation officers base their negotiations upon the actual cost of performing the architect-engineering services, plus adequate overhead, plus reasonable profit. Many of the Council members, according to the survey, feel that fees are based largely on percentage of the work, using inadequate estimates of construction costs in many instances, and that often fees provide inadequately for overhead and profit.

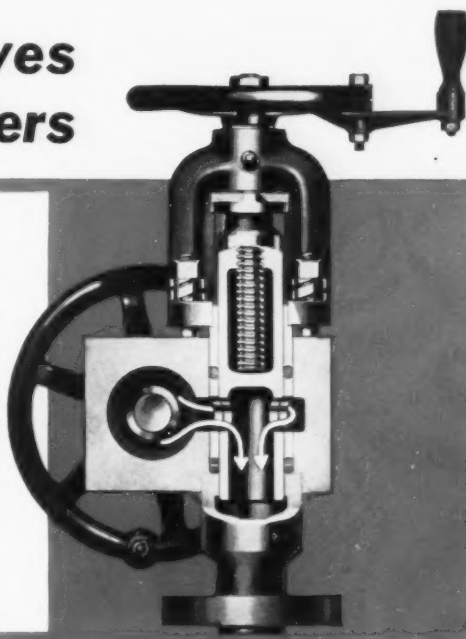
These are among the topics of discussion slated for later meetings between Barth and Council representatives.

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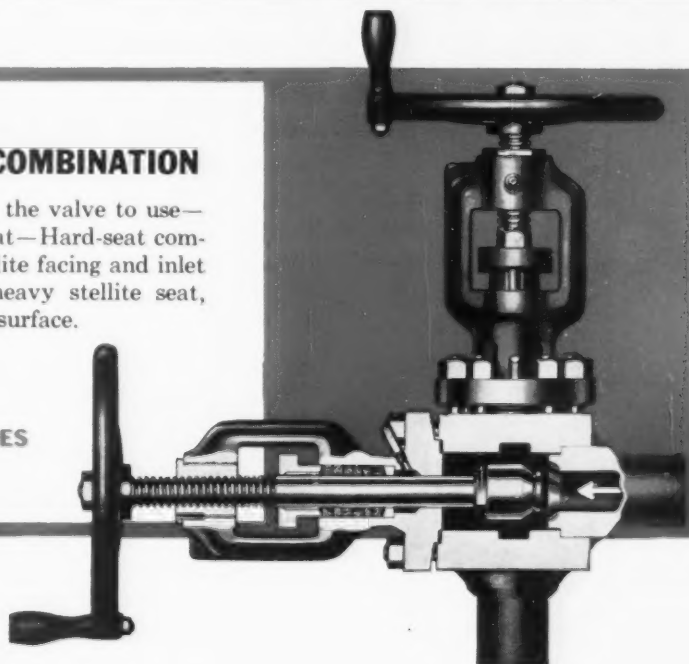


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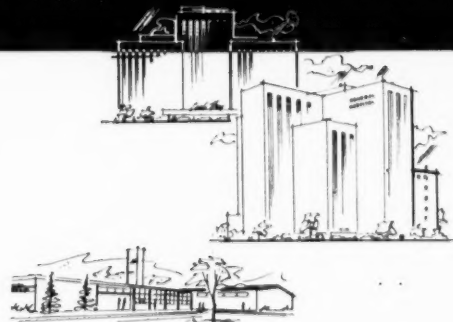
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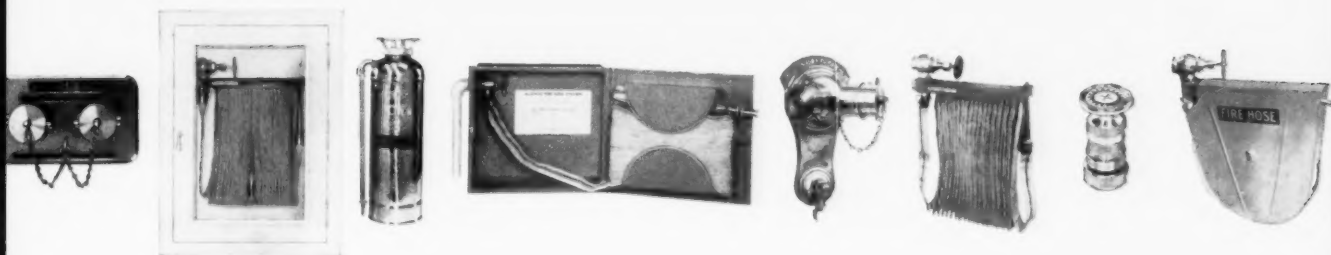
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Third Unit for Bombay Station

Two engineering representatives, Omprakash N. Joshi and Dattatraya G. Phatak, from the Tata Power Company Ltd. (Bombay, India) currently are working in the Hempstead, New York, offices of Burns and Roe, Inc. They are helping with the development of plans for a third unit to be added to the Trombay Thermal Electric Station, which is part of the Tata system.

The station went into commercial operation in December of 1956, with two, 62,500-kw turbine gen-



TWO TATA ENGINEERS (CENTER AND RIGHT) WORK WITH BURNS AND ROE ON TROMBAY PLANT ADDITION.

erators supplying electric power to the greater Bombay area. The new turbine unit will generate an additional 62,500 kw — a 50 percent increase in plant capacity — using high pressure steam at 1250 psig, 950 F.

Joshi and Phatak received degrees in mechanical and civil engineering, respectively, from the University of Nagpur, in central India.

Typical Swedish Consultant Firm

Typical of the larger consulting engineering firms in Sweden is Kjessler & Mannestrale AB, employing about 250 persons, some 190 of whom are either engineers or architects. With headquarters in Stockholm, K & M also maintains regular offices in Lulea, Gothenburg, and Halsingborg. In addition, they have small offices in other parts of Sweden for supervision of specific projects.

The Lulea office, in Lapland, which operates independently under the supervision of Engineer Lennart Sjoström, is in the center of an area that is undergoing rapid development. It is rich in iron ore resources, has waterfalls that supply large quantities of electric power, vast forests, and the outlets to the Gulf of Bothnia. The K & M office recently conducted tests to check the water drift prior to erection of a bridge to connect the island of Sandoklubb with the mainland. In a few years this channel is expected to be the most important northern ore outlet since it is much deeper than the one leading to Lulea and presently in use.

The Halsingborg office, under Civil Engineer Sten Gedda, is close to Malmö, Sweden's third largest city, and near the Danish border. This office frequently carries on joint projects with the Danish firm of Chr. Ostenfeld & W. Jonsen. K & M and this Danish firm, working together, specialize in prestressed concrete design. Recent projects include water reservoirs for the city of Vasteras, on Lake Malaren; two reservoirs of 62,000 cubic feet each for the city of Stockholm; and three sugar silos, each with a capacity of 88,000 cubic feet.

The Gothenburg office, under Civil Engineer Per Erik Jonson and Architect Ivar Ditlef-Nielsen, works mostly on traffic planning and industrial buildings.

Civil Engineer Sven Kjessler, director of the firm in charge of the main office in Stockholm, has 10 de-



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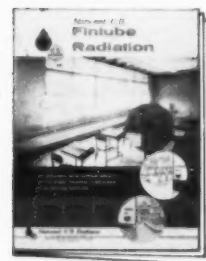
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partments under his direct supervision. One of the most active of these is the Bridges and Harbors Department which has been responsible for a large number of the bridges, wharves, and viaducts for which Sweden is noted.

The purification plant for the city of Kiruna, 90 miles north of the Arctic Circle, designed by the Water Works and Sewage Purification Department, is noteworthy because of the conditions imposed by the site. It was designed as a totally enclosed unit for protection from the climate.

The newest department is the Soil Mechanics Department headed by Bertil Lofquist, DSc (Eng.) who is now in Yugoslavia as a UN expert on earth dams. During its first year of operation the department acted as consultant on secondary settlements and vertical sand drains for the projected new Stockholm airport, on Lovo island.

The Photogrammetric Department has pioneered in the use of

special precision instruments along with the photogrammetry in road planning. The department uses a Swiss-made Wild autograph of the A-7 type. The gear-box magnifies eight times and has a geometrical increase of five times. Using good photographs, the machine can produce clear-cut drawings enlarged 40 times.

The A-7 Wild, which costs about \$40,000 in Sweden, has proved so satisfactory that the firm is planning the purchase of a smaller Wild, an A-8, at a cost of \$23,000.

The aerial photographs used are supplied by Rikets Allmänna Kartverk (Geographical Survey Office). They have on file the whole of Sweden, photographed in the summer months from a height of about 12,000 feet. Sweden is being photographed from the air in full every eight years. Lower altitude maps, for traffic planning or residential buildings, are photographed on order.

With the A-7 autograph, K &

M can map and design several stretches for a proposed highway and measure its profile. For a profile of three miles, the standard error is about three feet in elevation. With good pictures, the department can cover an area of 415 acres, mapped at the scale of 1:2000 in less than a week.

At present, Kjessler & Mannestrale AB are headquartered in three private houses in Stockholm but they currently are looking for larger quarters.

Problems Tackled at Hydraulic Lab

Five years ago the British Department of Scientific and Industrial Research established its Hydraulic Research Station at Wallingford, on the River Thames. Already it has produced satisfactory solutions to specific problems of flooding, harbor construction in difficult seas, erosion, and dam construction in many countries.

From Pakistan came the question of controlling the Karnafuli River so that the port of Chittagong, 10 miles from the sea up the tidal estuary, could be extended. The river meanders and the channel is unstable. Because of the monsoon, the river's fresh-water discharge ranges from 2000 to 250,000 cu ft per second. The researchers found ways to stabilize the river's course and handle the varying flow of its waters, and Chittagong's expansion plan is now under way.

A new harbor was needed at Tema, in the new state of Ghana, in West Africa. A 13,000-ft long stretch of coast was selected and the Wallingford scientists showed that the proposed breakwater could be 500 feet shorter than was originally proposed. (See page 142) They also planned the layout for a fishing harbor.

Other problems they have tackled include the avoiding of a large eddy caused by the 200-ft drop from a weir on the Navet Dam, in Trinidad, by means of small deflector walls. They produced a floor relief plan for the British city of Shrewsbury and a replan-

another HEVI-DUTY installation

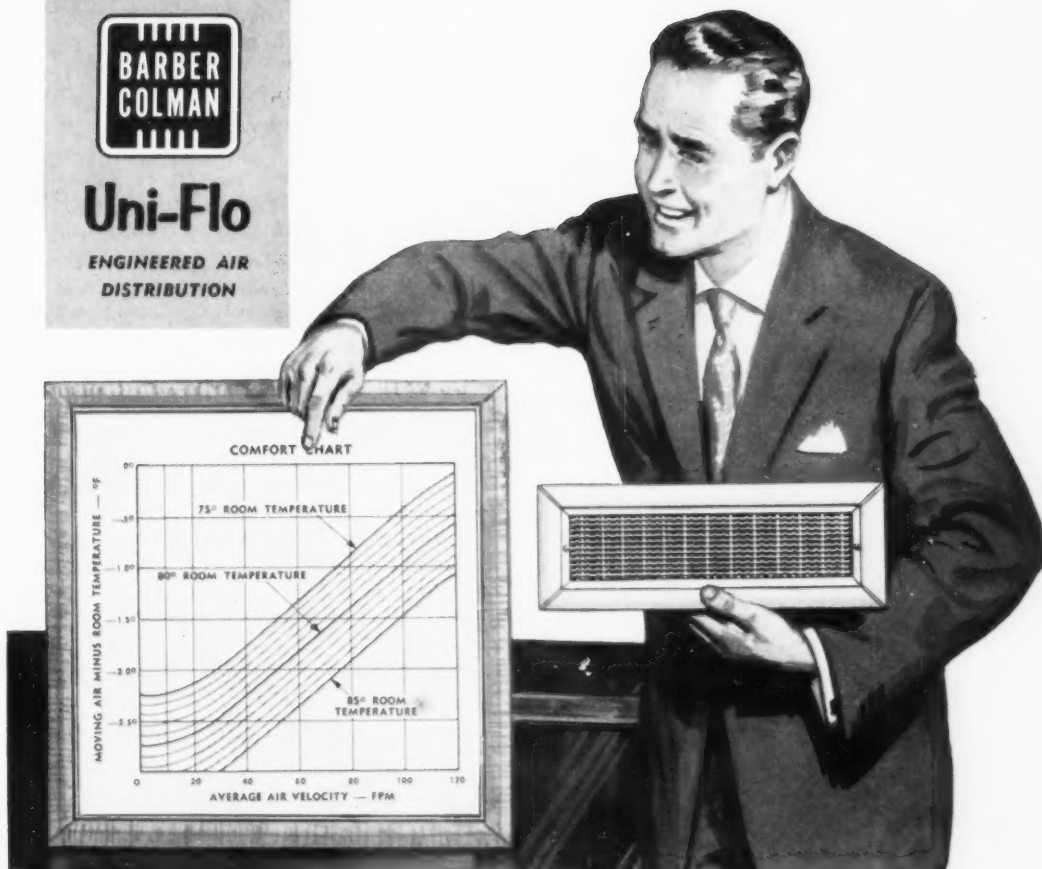
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ning of the great naval base at Portsmouth, England.

The method used in most instances is the same. It involves a combination of the practical experience of engineers plus a knowledge of local conditions and experiments with models.

The models employ a pneumatic tide generator in which a valve opens and shuts to simulate the movement of a tide. It can reproduce a 12-hour tide cycle in 96 minutes, building up sand bars and silt and charting the tide.

For problems that deal with the shifting of sands in water, an experimental flume 350-ft long and 5-ft wide is used, with adaptations to suit each individual site. Some of these experiments have taken as long as 2500 hours to solve.

The Wallingford Research Station is staffed by 130 workers, of whom 20 are scientists. The director is Sir Claude Inglis, who has had long experience in this type of work, in India. Its annual

budget is \$365,000, part of which is recovered in client fees.

Role of the CE in Britain

Sir Henry Clay, a partner in the London consulting engineering firm of McLellan and Partners, and G. Ovens, its technical director, in a paper presented before the British Electrical Power Convention, described the role of the British consulting engineer in keeping first cost down for the electrical equipment in a plant, while ensuring that the equipment is adequate.

Of the total cost of electrical equipment in a plant, they estimated that 60 percent was required for such services as electrical distribution, communications, provision for compressed air, and other auxiliaries. They emphasized the importance of taking into account the ideas of the plant engineers, both in the development and maintenance departments. However, particularly

in smaller plants, it was found that there was a lack of confidence between the two departments, resulting in too much dependence on the machinery and equipment manufacturers' advice. It is here, as a disinterested party, that the consulting engineer was found to be of the greatest value. Because of his broad background of solving such problems in various types of industries, he could provide a more economical plant.

It also was pointed out that in an existing manufacturing plant that was expanding or reorganizing, the consulting engineer must enlist the cooperation of the maintenance engineers. In a new plant he is frequently called on to help find and train maintenance men.

New Volga-Baltic Waterway

A new waterway linking the Volga and the Baltic Sea is scheduled to be opened at the beginning of 1960. The two water systems are at present served by the Marrinsky waterway, with four locks out of action through flooding by Rybinsk reservoir waters.

The new waterway is already under construction. In the main it will follow the newly-formed reservoirs created by six dams; the watershed sectors will be crossed by navigation canals. In some places riverbeds also will be straightened by navigation canals. A canal 12.6-km (about 7.56 miles) long already has been dug near Lake Onega to cut across the bends of the river Vytegra. The total length of the Volga-Baltic canal will be 361 km, which is three and a half times as long as the Volga-Don Canal and three times the length of the Moscow Canal. There will be nine locks to form a graded ascent. A motor road is being built along the waterway on the northern slopes of the watershed and settlements are being built at each lock installation for use of the staff.

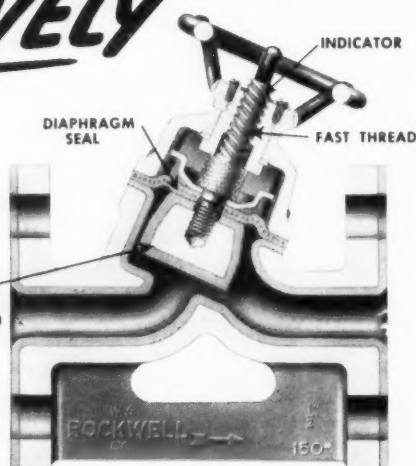
British Columbia Seeks More Power

Preliminary surveys of the northern and central Rocky

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Diaphragm for
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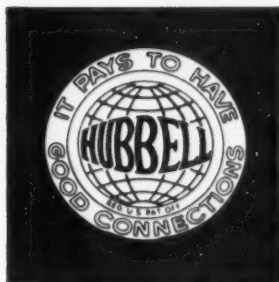
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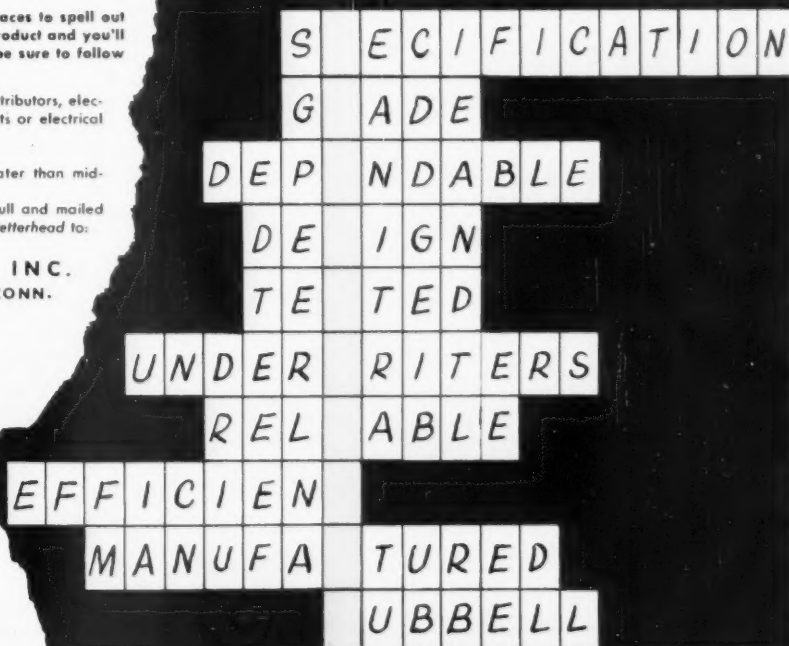
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Mountain Trench area of British Columbia by the London firm of Thomson-Houston Co. Ltd. indicate that at least 4,000,000 hp can be generated by using waters of the Peace River for a new hydroelectric scheme. An agreement to proceed with surveys has been reached with the provincial government and Wenner-Gren Development Co. (B.C.) Ltd.

Estimated to cost between \$400 and \$600 million, the project involves construction of the largest known man-made reservoir. It will extend some 260 miles along the Rocky Mountain Trench and will take about seven years to fill although power can be produced before full storage capacity has been reached.

Exact location of the dam or dams will be determined after surveys and diamond drillings are completed next year. A likely location is the junction of the Parsnip and Finlay Rivers where no diversion of either would be nec-

essary and relocation of highway and railroad grades would present no complex problems.

Creation of the reservoir, at approximately 2550 feet above sea level, will regulate the Peace River flow with additional power advantages for the adjoining province of Alberta. About 40,000 cubic feet of flow per second instead of the present yearly variations from 8000 in winter to nearly 200,000 in flood times will be obtained. A further advantage will be avoidance of cyclic variations associated with a dry year.

Later, the Liard Basin, in B.C., will be developed to produce extra power for use as far south as Vancouver.

It is believed that the vast body of water may make the province's northern climate warmer, encouraging settlement.

New Port for Ghana

Rapid progress is being made with the port of Tema, 20 miles

from Accra, which when completed will be one of the two most important harbors in the new state of Ghana, West Africa, on the Gold Coast. At present, Takoradi is the only sizeable harbor in the country.

On the flat, sandy Guinea coast, two breakwaters of rock rubble are being placed at the rate of 50 feet a week to enclose an area of 500 acres.

Two large cranes stand on the end of each breakwater unloading railroad trucks of rubble and dropping 5- and 10-ton rocks into the sea. As the stones are placed, the cranes advance towards each other along what will be 2½ miles of breakwater.

The decision to build a modern port at Tema was taken in 1951. Sir William Halcrow and Partners prepared the project, and Parkinson Howard Ltd., of London, are doing the engineering. If the Volta hydroelectric power project is adopted, Tema will export the aluminum produced.

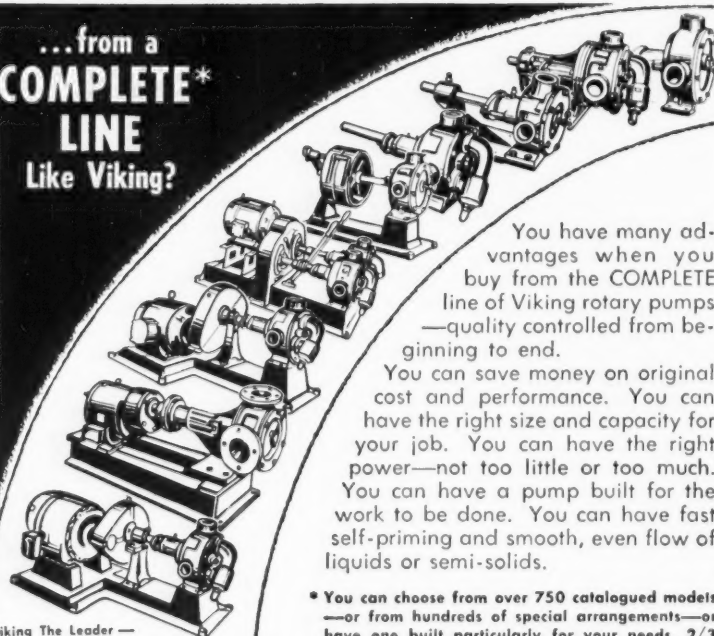
It has been a problem to get stone to this flat sandy shore. Between 1952 and 1954, at a cost of nearly \$9 million, 40 miles of railroad track and 20 miles of highway were laid. The harbor is due to be completed by 1960 at an estimated cost of \$21 million.

The Wallingford research station of Britain's National Physical Laboratory has assisted in the design of Tema by building a scale model of the harbor and subjecting it to rough seas. This led to some modification of the breakwaters and redesign of the adjacent fishing harbor. (See page 138.) But it could not foretell the freak waves that sometimes occur on this coast, thought to be due to disturbances of the ocean bed. Two such waves have hit the harbor in recent months.

Since then work has gone without major setbacks. Rock has been brought 20 miles from the quarries at the rate of 150,000 tons a month. The 110 engineers manage a labor force of 1600 natives in the task of settling inter-

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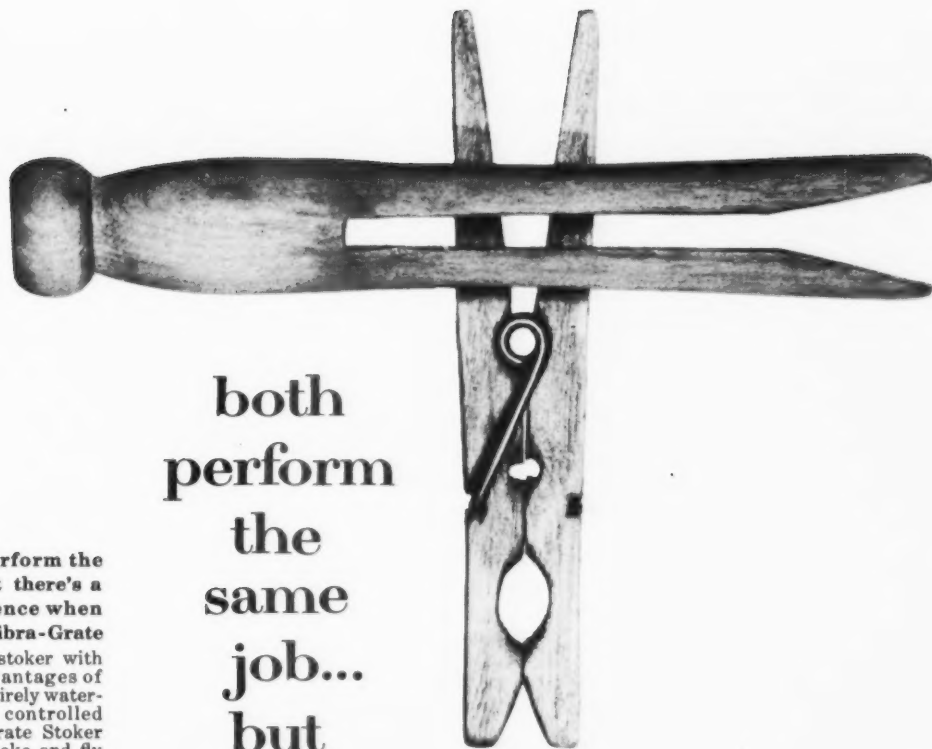
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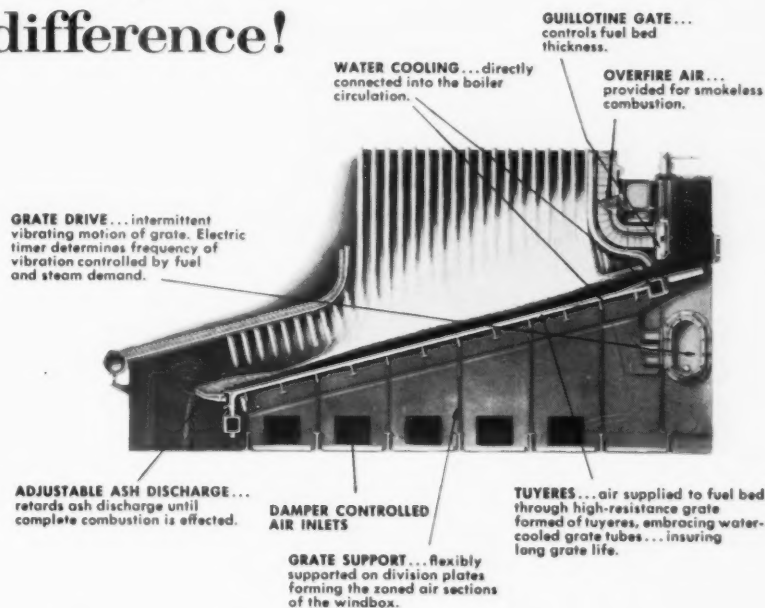
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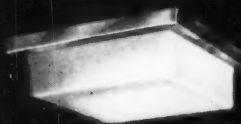
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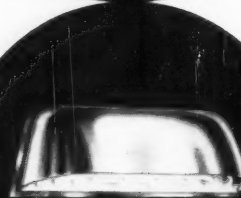
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locking 15-ton concrete blocks onto the seabed.

Ashore, office buildings of concrete and glass are being constructed. A nine-story office block to be occupied by the Harbor Authority also is planned.

Tema is expected eventually to support a town of 70,000 people.

Plan Cross-Channel Power Exchange

Differences in living habits have made feasible a plan for exchanging electric power between Britain and France over a cross-Channel cable. The plan is based on the fact that, owing to differences in the pattern of life in the two countries, peak periods during which more electricity is used vary on either side of the Channel, the French peak demand occurring about an hour earlier than the British. The extra demand on power has to be met in both countries by a plant that is not needed at other times.

The proposed cable will have a capacity of 150,000 kilowatts. An interesting feature of the operation will be the use of direct current at 200,000 volts, instead of the 3-phase alternating current normally employed in France and Britain. Not only will direct current avoid power losses inherent in ac distribution, but it will eliminate the need for synchronization of generators.

The direct current will have to be converted into alternating current at each end of the cable before tying in with networks in the two countries. This process of conversion at high voltage and load has only recently been made possible, and the scheme will be the first dc project joining very large electrical systems.

Port Development Expedited

The Government of India is sending a mission to Europe to purchase urgently needed equipment for port development. Heavy imports of machinery and equipment for industrial projects and irrigation and power development, and large orders of steel

for the railways have strained the existing facilities at India's three major ports — Calcutta, Bombay, and Madras — almost to the point of breakdown.

The congestion at Bombay port is so great that ships are often held for three weeks before they can be berthed for unloading. Harassed port authorities are using the adjoining naval dockyard to unload ships carrying grain from the United States, and they even are considering proposals to convert the coastal ferry wharves into berths for ocean-going craft. The quantity of goods handled by the port yearly exceeds 12 million tons more than double the quantity handled before the second World War.

Conditions in Calcutta port, where traffic congestion is aggravated by dock labor troubles, are even worse, and the Government will give the highest priority in its port development program to expanding facilities here. Calcutta's freight capacity of 8-million tons a year will soon be increased by 800,000 tons, with completion of 22 lighterage points.

This port's most immediate needs are 29 mobile cranes, one floating crane, 45 other cranes, and fork-lift trucks and trolleys. A 200-ton electric crane, said to be the largest in South Asia, went into operation at King George's Dock, Kidderpore, Calcutta.

A mechanically operated dump will speed the movement of coal in the port, and the port railway will be completely remodeled before 1961 with diesels replacing the steam locomotives now in use.

A proposal to establish a fund for shipping expansion is under consideration by the Government. Private and state-owned shipping companies will receive loans from the fund, which will amount initially to between \$21.4 and \$25.7 million to purchase new vessels to reach the second plan target of 900,000 tons. The plan allocation of \$79 million already has been spent, but the orders placed abroad and at the state shipyard

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at Vishakapatnam fall short of target by 100,000 tons.

Indian shipping experts place the country's current needs at two-million tons, which would render unnecessary the payment of \$150 million yearly to foreign ship owners as freight dues.

British engineers are advising the Government on the location of a second state shipyard and have completed a preliminary survey of several suggested sites on both the east and west coasts. Building of the yard is unlikely during the second plan unless the difficulties with foreign exchange ease considerably.

Despite this uncertainty, several British and continental engineering firms connected with the shipbuilding industry have come forward with offers to undertake the work.

Salt-to Fresh-Water Plant

A new type of distillation plant for producing pure water from the sea has been developed by the British engineering firm Richardson, Westgarth and Company, Ltd., Wallsand-on-Tyne, England.

Final design for the plant is based on the results of an exhaustive series of tests carried out under industrial operating conditions on test rigs using sea water.

The process makes possible the building of a plant with an output of up to one-million gallons a day. Operating methods allow the plant to be run without being opened for cleaning and without loss of output from scaling.

A refinery in Ecuador already has ordered a distillation unit of the new type.

Plan to Irrigate Deserts

Soviet hydraulic engineers are working on far-reaching plans to alter the course of Siberian rivers in order to irrigate the deserts of the Aral-Caspian basin. The plans, conceived sometime ago, involve draining of swamps, digging new canals, and irrigating the steppes. The key to these plans are the Rivers Ob and Ye-

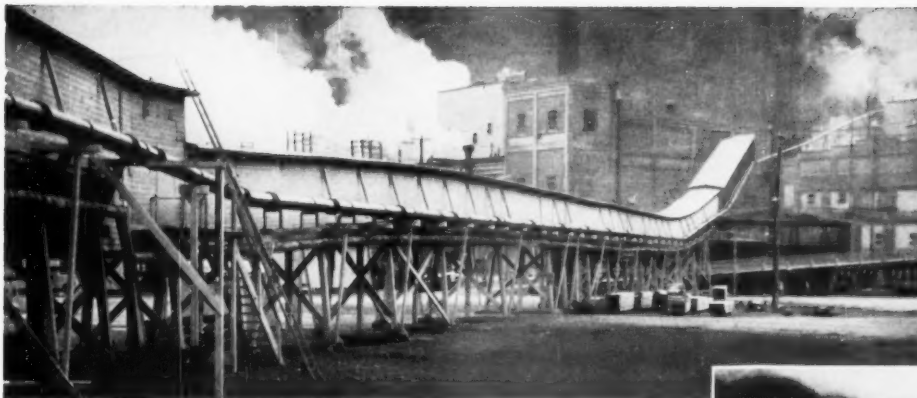
nisei with huge volumes of water, reaching thousands of billions of cubic meters, emptying into the Arctic Ocean. The southern Siberian deserts could be made fertile by irrigation.

Among the many plans for irrigating the southern wastes is one put forward by a Soviet civil engineer, Davydov. The essence of the plan is to dam the River Ob at its confluence with the Irtysh and create a huge inland sea. This sea would provide water that would be brought through a 373-mile long canal cutting across the Turgai tableland. From the southern slope of this tableland, the water would flow by gravity along the beds of old, dried rivers and existing streams.

The flow of water from Siberia will be increased by an envisaged diversion of the river Yenisei and Podkamennaya Tunguska to create a huge water reservoir. This would be linked with the Ob water reservoir to provide a flow for the 2480-mile run to the Central Asian and Kazakhstan steppes. The size of this artificial river, experts figure, would compare with the size of the Volga.

Three hundred billion cubic meters of the Ob-Yenisei water would be sufficient to irrigate over 11,580,000 square miles of desert land, creating an oasis of agriculture in desert regions. The whole Aral Sea-Caspian Depression would be cultivated and planted in cotton, citrus fruit, vineyards, and plantations of industrial crops. The mountain ranges around the Depression would contribute to a change in the climatic conditions of the area by increasing the evaporation rate and the humidity of the basin and eliminating the extremes of temperatures from day to night.

The man-made river also would be utilized to provide electric power for the Urals and Siberia. Hydro power stations are planned on the southern slopes of the Turgai tableland and in Kazakhstan and Central Asia. Another



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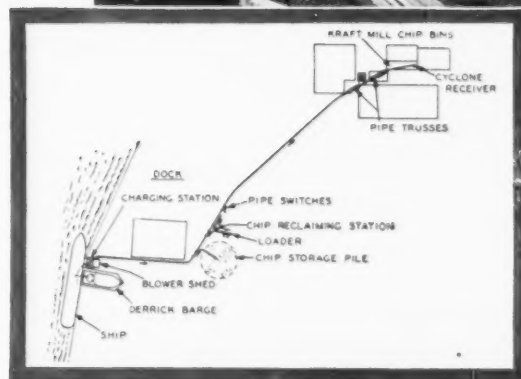
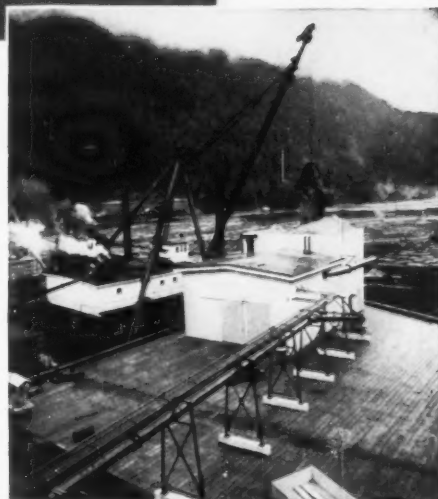
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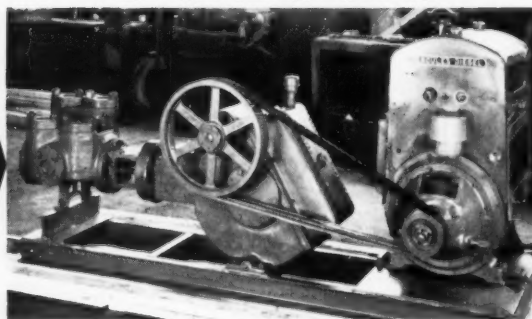
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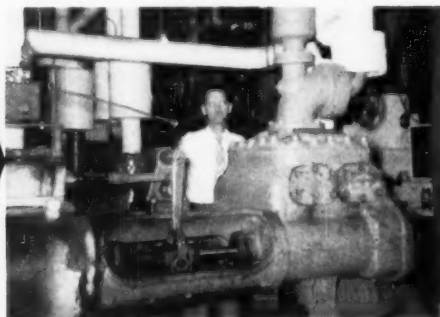
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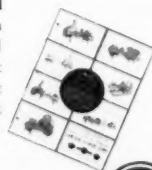


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advantage of this scheme would be the water transport facility it would provide. The new waterway would link the Kara Sea with the Aral and Caspian Seas with the total navigational length of some 5000 miles. Direct river routes would be created from the sub-Arctic River Igarka to the ports of the Black Sea, from the Ob to the Baltic, and from the River Yenisei to Moscow. In the future this waterway could be linked with Lake Baikal and the tributaries of the Lena and along the far eastern rivers and through the Amur basin with the Pacific.

The diversion of the Siberian rivers to the south would solve several problems simultaneously, that of transport, climatic improvements, irrigation, and hydro power production. This prodigious scheme would take more than 20 years to put into operation.

Huge Reservoir Under Construction

The biggest water reservoir in the Caucasus area is now under construction as part of the Kuban-Talaus irrigation system, north of the Caucasus. So far some 500,000 cubic meters of soil have been shifted. The River Kuban will fill a large salt lake whose level will be raised by construction of an 8.7-mile dam. The artificial basin will have a storage capacity of 1.3-billion cubic meters of water. This will be enough for the yearly demand of the irrigation system which totals 3875 km (2407 miles) of main and distributing canals. In addition the Kuban water will fill over 3000 km of step creeks that dry up during the summer. The system will irrigate 260,000 hectares (100,360 square miles) and supply water to 3,000,000 hectares of collective and state farms.

Consultant Chosen for Kyle Dam

M. Andre Coyne, the world famous expert on high arch dam design, who is largely responsible for the design of the Kariba Dam, in Rhodesia, has been appointed consultant for southern Rhode-

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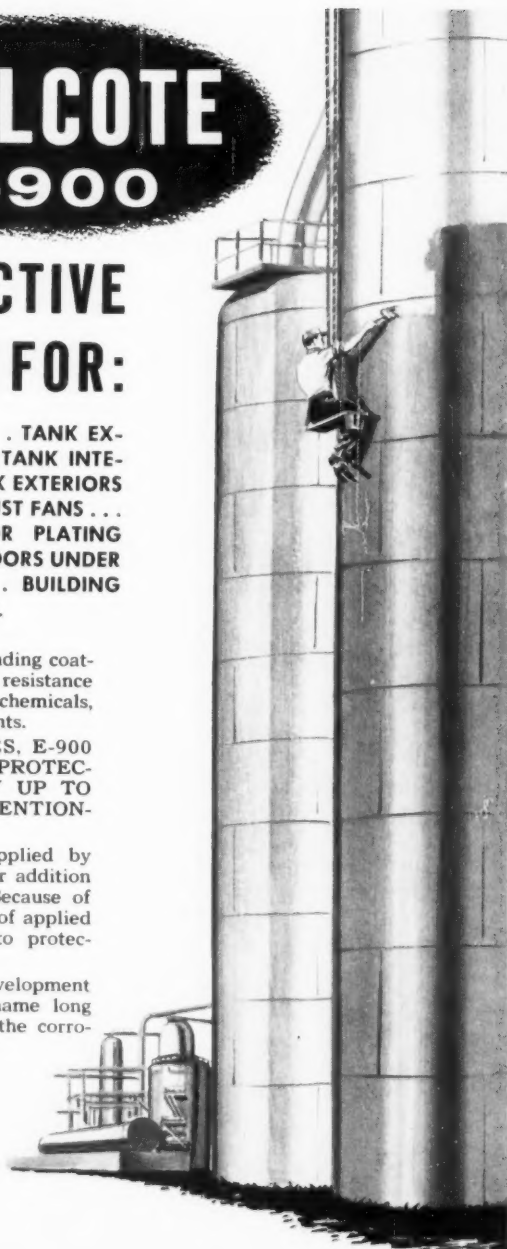
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sia's Kyle Dam project, in collaboration with the Colony's Division of Irrigation. M. Coyne expects to have the design of the Kyle Dam complete in a short time.

The Kyle Dam will be a concrete arch structure similar to the Kariba Dam and will hold back a lake of 900,000 acre feet. It will take about three years to build. One of the main preparatory tasks still to be done is a detailed survey of the access road to the dam site.

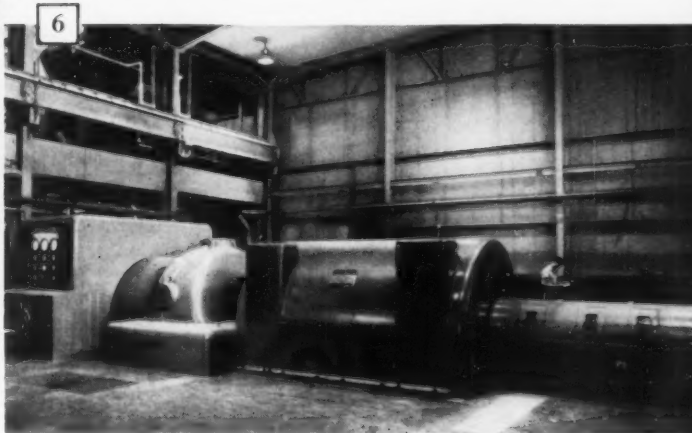
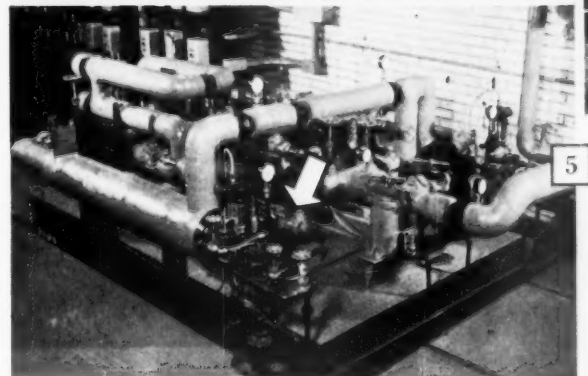
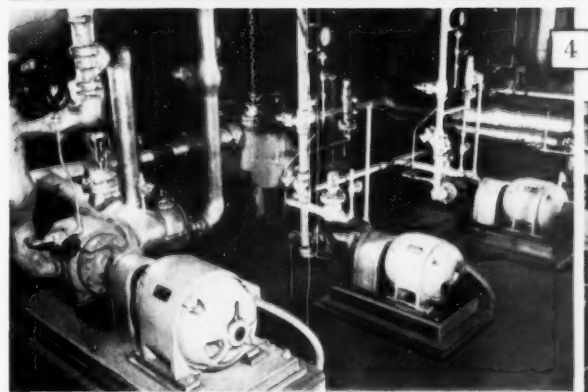
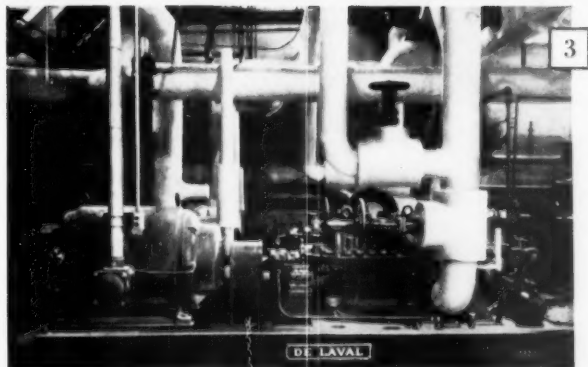
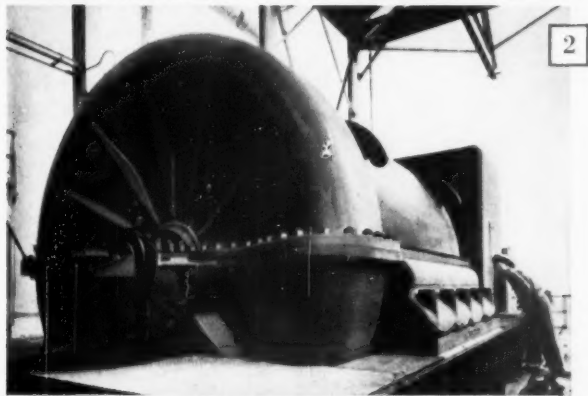
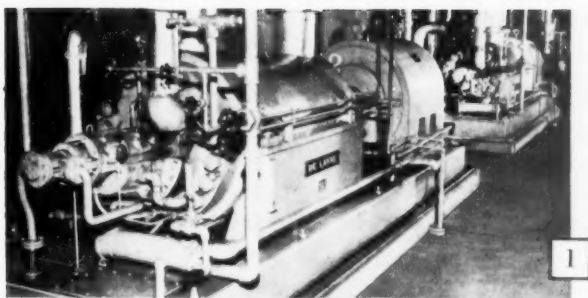
Highway Near Completion

Venezuela's new 98-kilometer (62 miles) Tejerias-Valencia highway is nearing completion. The first leg of the highway, a 19-km stretch, already has been opened. The new highway, which will connect with the 50-km stretch leading to the nation's capital, Caracas, will be 32 meters wide and will have six lanes — three in each direction — with fixed speed limits of 120, 80, and 60 kilometers an hour. The project includes a 500-meter tunnel near Maracay. The Valencia airport presently is closed to permit contractors to push through a segment of the new superhighway over the area.

Hydro Power for Scotland

The North of Scotland Hydro-Electric Board will build a \$24.5-million, 450,000-kw power plant, to be known as the Awe Project, designed to utilize the flow from 324 square miles of the River Awe catchment area. The first large-scale pumped storage in Scotland, it will be constructed in three sections — Inverawe, Cruachan, and Nant.

Meanwhile, the suitability of two sites on the banks of Loch Lomond for the erection of power stations operated by stored water and capable of utilizing power generated in off-peak periods also is being investigated by the Board. One site is near the Loch Sloy hydroelectric power station, and the other is at Burn of Mar, Balmaha, on the south-



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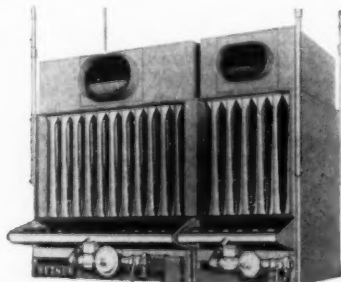
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east shore of Loch Lomond. If the new project materializes, it is believed that it may be of the same type and possibly as large as the Awe project.

Ontario Turns to Steam Plants

Two large steam plants for the generation of electricity, both larger than any existing similar plant in the world, are being planned by the Ontario Hydro-Electric Power Commission. Providing present negotiations and planning are successful, preliminary construction work should start before the end of the year and both plants should be completed by 1968. Total cost of the two plants is being estimated at \$500 million.

Sites contemplated for the plants are the Long Branch Rifle Ranges, in the western part of Metropolitan Toronto, and a lake-shore property in the Burlington Bay area. Negotiations are at present underway for the sites.

The plants will have a capacity of 1,800,000 kw each, much greater than that of Toronto's Richard L. Hearn plant, which is one of the world's largest with its present capacity of 400,000 kw. It, too, will be enlarged and by 1960 will have a capacity of 1,200,000 kw.

Decision to build the two new plants is based on the estimated increased demand for electricity. Hydro foresees that, within ten years, Ontario's demand for electric power will be twice what it is now, and in 25 years will amount to four or five times today's requirements.

Since practically all water power sites in southern Ontario have been developed, the Commission is faced with two alternatives: development of electric power from steam plants, or development from nuclear plants.

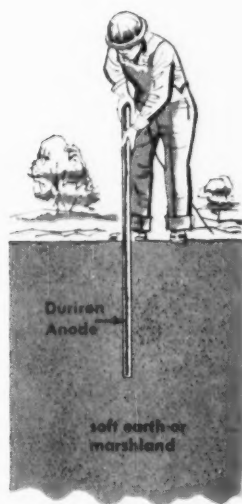
Since the latter is still in the experimental stage and necessarily some time off, Hydro has to depend for the present on the development of steam-generating plants. ▲▲

32 DURIRON[®] ANODES protect 11,000 feet of steel water line without backfill

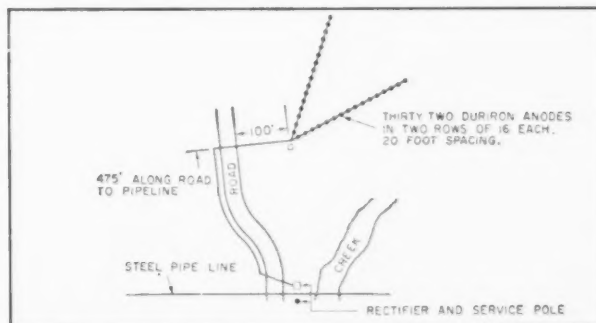
The Problem:

An isolated section of 11,000 feet of steel water line needed cathodic protection. Tests showed current requirements to be 40 amps., but replacement of adjacent wood stave lines called for extra capacity. Ground was a peat bog with water table standing at 6 inches below surface, making backfill methods impossible.

The Installation:



32 Duriron Anodes (2" x 60") were installed without backfill, by digging through the dry surface and then pushing anodes down until the tops were 3 feet below surface. Anodes were installed 20 feet apart, in two rows, with a calculated resistance of one ohm, based on previous experience with similar installations. While conventional backfill columns would have reduced the number of anodes necessary, the use of bare anodes constituted a major saving in cost.



The Performance:

The anode bed is discharging 60 amps. at a terminal voltage of 59 volts. The entire line section is under protection, the minimum potential being 1.18 volts. This affords ample margin to handle prospective additions to the line. Agreement between actual and calculated anode resistance is quite close.

Action:

For further information on this particular installation or for technical assistance on other Duriron impressed current anode installations, write:



THE DURIRON COMPANY, INC. / DAYTON, OHIO

Allis-Chalmers announces... **Newly**

1

Gang-operated disconnect switch isolates starter from incoming power — assures safe entry of high voltage compartments.

2

Steel cubicle is compartmentalized — separates high and low voltage equipment.

3

Short-circuit protection is provided by fast-acting current-limiting fuses, rated 150,000 kva at 2300 volts and 250,000 kva at 4160 or 4600 volts.

4

Overload protection is handled by accurate relays which trip only on excessive motor current, preventing needless motor stoppages.

5

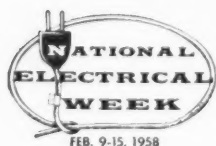
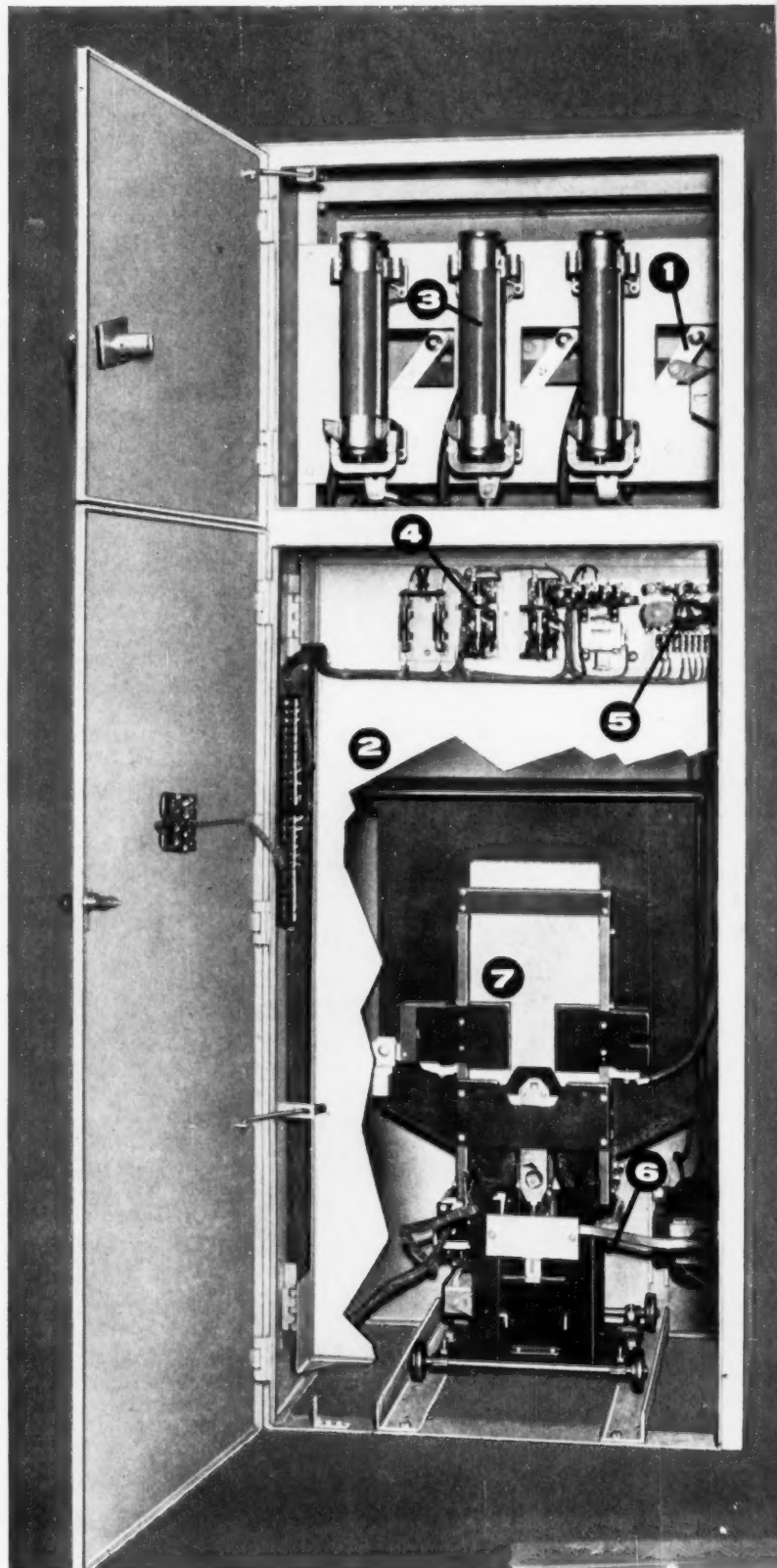
Undervoltage protection instantaneously opens line contactor on loss of voltage. Time-delay undervoltage protection also available.

6

Mechanical interlock coordinates contactor, disconnect switch, upper door and inner control barrier for maximum safety.

7

Roll-out contactor makes maintenance easy—even in narrowest aisle space. (Routine inspection and maintenance can be done with contactor in place.)



Designed

Type H High Voltage Motor Control

Combines front access
with space economy...

In addition, you get maximum protection for personnel and machines, thoroughly tested components, and ample panel space for modifications. It's all built into the *smaller cabinet* of a newly designed line of Type H high voltage starters from Allis-Chalmers.

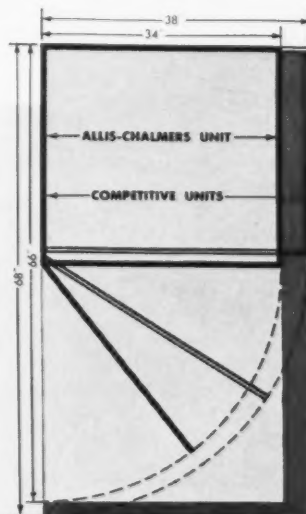
Here is control that couples compactness with roominess (for ease of maintenance) . . . here is a starter that joins test-proven performance with versatility (for addition of meters and relays) — AND the line meets every 2300 to 5000-volt motor need.

For more information on this engineering advance, contact your A-C representative or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



ALLIS-CHALMERS UNIT requires 2.3 sq ft less floor space than any competitive unit. Put 10 A-C units in the same area needed for 9 cabinets of other manufacture.

Indicates 2.3-sq-ft saving in floor space



ALLIS-CHALMERS



A-5517

New Projects Reported

By Consulting Engineers—

ALABAMA

Keller Weaver
Birmingham, Alabama
Shops, Mt. Brook, Ala. (struc., mech.) \$60,000. Client, Edwin Ceitlin.

Refrigeration-storage building addition, Montgomery, Ala. (struc., mech., elec.) \$80,000. Client, Dairy Producers, Inc.

Dean Engineering Company
Albany, Georgia
Waterworks improvements, new tank, main extensions, distribution system improvements. \$75,000. Client, Town of Ashford, Ala.

McDonald & Hooper
Andalusia, Alabama
Sanitary sewers, Andalusia, Ala. (civil) \$65,000.

ARIZONA

John A. Carollo, Consulting Engineers
Phoenix, Arizona
Sewerage improvements for City of Show Low, Ariz. (civil) \$138,445. Client, City of Show Low, Ariz.

Bathhouse and swimming pool for Alkire Park. (civil) \$100,000. Client, City of Phoenix, Ariz.

Bathhouse and swimming pool for Perry Memorial Park. (civil) \$150,600. Client, City of Phoenix, Ariz.

Glenn A. Baker, Electrical Engineers
Phoenix, Arizona
Lighting of parks and playgrounds within and outside City of Phoenix, Ariz. (elec.) \$200,000. Client, City.

CALIFORNIA

W. H. Hermes III, P.E.
San Diego, California.
Riverview Elementary School, San Diego County, Contract #2. 8 classrooms, 2 kindergartens, administration building. Classroom unit ventilators, central boiler plant, forced hot water, propane. (mech.) \$20,000 (mech. only) Client, George Lykos, A.I.A.

Lakeside Farms additions elementary school, Contract #3. (mech.) \$10,000 (mech. only) Client, George Lykos, A.I.A.
Survey for rehabilitation and remodeling of boiler plant and plunge

at Mission Beach, San Diego. (mech.) Client, City of San Diego.

Electro-Instruments Mfg. Co. new plant, San Diego. 46,000 sq ft, complete air conditioning. (mech.) \$100,000 (mech. only). Client, George Lykos, A.I.A.

W. Wilson Junior High School, arts and crafts building addition, 30 rooms. Boiler plant, shops. Plumbing, heating, and ventilating, San Diego. (mech.) \$100,000 (mech. only) Client, Wulff & Fifield, A.I.A.

Four-story fire tower, San Diego. (mech.) Client, Wulff & Fifield, A.I.A.

Four restroom buildings, San Diego. (mech.) Client, R. Fawble, A.I.A.

Noncommissioned Officers Club, MCRD, San Diego. (mech.) Client, Wulff & Fifield, A.I.A.

Three electronic schools, MCRD, San Diego. (mech.) Client, Wulff & Fifield, A.I.A.

Church and hall. Plumbing, heating, and ventilating. Fletcher Hills, La Mesa. (mech.) \$500,000 (total). Client, Robert Fawble, A.I.A.

St. Sophia Church, rectory, school, and convent. Spring Valley, San Diego County. 1000 seats. (mech.) \$100,000 (mech. only). Client, George Lykos, A.I.A.

Unitarian Church, San Diego. (mech.) Client, George Lykos, A.I.A.

Lemon Grove Catholic Church, 1000 seats, San Diego County. (mech.) \$400,000. Client, George Lykos, A.I.A.

The Fluor Corporation, Ltd.
Los Angeles, California
Design, engineer, and construct new power plant consisting of two 60,000-kw reheat turbogenerator units, near Daggett, Calif. \$25,000,000. Client, California Electric Power Co.

R. E. Layton & Associates
San Leandro, California
Comprehensive report on drainage for new metropolitan Oakland International Airport, Oakland, Calif. Client, Port of Oakland, Calif.

Waters, Ruth & Going
San Jose, California
Resurfacing of runway, station

streets, and replacement of switchgear, Moffett Field, Calif. \$250,000. Client, U.S. Navy, Department of Public Works, 12th Naval District, San Bruno.

COLORADO

K. J. Murray
Rishel Junior High School, Denver, Colo. \$2,300,000. Client, Gordon White, Denver, Colo.

Ramsey and Reeves
Denver, Colorado
Laboratory building. Masonry construction, bearing walls, laminated wood beams, one-story, 7500 sq ft, hot water heat, partially air conditioned. (civil, struc., mech., elec.) \$150,000. Client, Kerr-McGee Oil Industries.

Ken R. White
Denver, Colorado
Reconstruction of east-west and north-south runways, taxiways, new airfield lighting, and drainage facilities. Pueblo Municipal Airport, Pueblo, Colo. \$1,000,000. Client, City of Pueblo, Colo.

FLORIDA

Jas. Gamble Rogers, Lovelock & Fritz
Alteration and additions to Cherry Plaza Hotel, Orlando. Addition of three rooms on roof. 64 bathrooms, air conditioning entire building, swimming pool, cabanas, new dining room, and kitchen equipment. (civil, struc., mech., elec.) \$550,000 for first unit plus \$300,000 later. Client, Cherry Associates, Inc.

Womens' State Prison, Ocala. Additional facilities including laundry, three new dormitories, hospital addition, helps' residences (12), dairy barn and facilities, enlarging sewage plant, paving, grading, and drainage. New kitchen for 900 people, tailor shop. (civil, struc., mech., elec.) \$1,500,000. Client, State of Florida, Board of Commissioners of State Institutions.

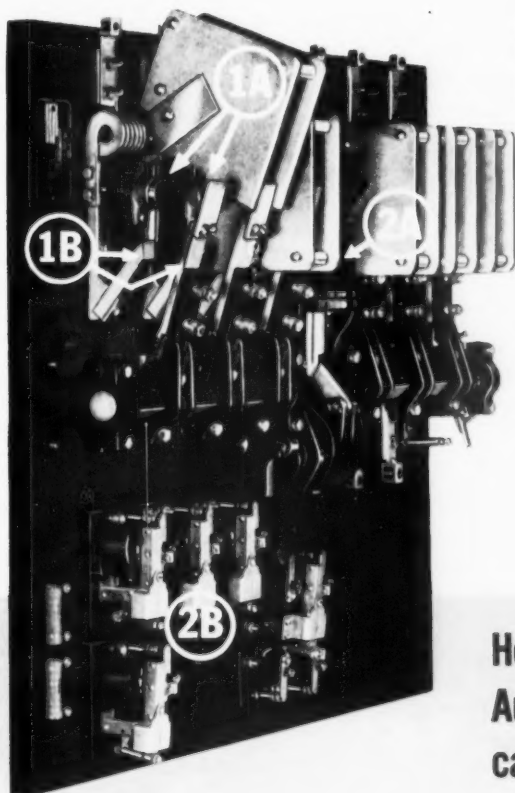
U. D. Gosselin, Consulting Engineer
Ocala, Florida
Alteration and foundation design of batching plant. \$20,000. Client, Universal Concrete Pipe Co., Ocala, Fla.

George A. Gieseke
Philadelphia, Pennsylvania
Water distribution system. \$150,000. Client, Norman W. Johnson.

Sanitary sewers. \$275,000. Client, developer of Plantation Isles.

Sewage treatment plant. \$350,000. Client, developer of Plantation Isles. All projects are within sub-division

...WHY your Automatic Transfer Switch should be rated for continuous duty



In the normal position, the transfer switch feeds the load circuits continuously.

Likewise, when normal power fails, and the load is transferred to emergency, the switch may remain in that position indefinitely.

In either position, a continuous duty switch is essential for proper operation.

How is a "Continuous Duty Rating" Established?

NEMA Standards for Industrial Control include the following definitions:

- Standard IC 1-1.161 Continuous Duty
Continuous duty is a requirement of service which demands operation at a substantially constant load for an indefinitely long time.

- Standard IC 1-1.182 Continuous Rating
Continuous rating is the rating which defines the substantially constant load which can be carried for an indefinitely long time.

To meet NEMA Standards, temperature rises must be well below those established for 8 hour rated devices, and the quality of contact must be sustained through proper contact design — preferably through the use of multiple contact systems.

ASCO Automatic Transfer Switches are designed to temperature limits as specified in the A.I.E.E. Standards for 24 hour rated devices — and are rated for continuous duty in accordance with NEMA Standards.

Here's why ASCO Automatic Transfer Switches can give continuous duty service:

1. Use of separate make and break contacts (1a), with separate current carrying contacts (1b), insure absolutely clean current carrying contacts at all times.
2. Momentarily energized main operating coil (2a), and low loss supervisory relays (2b), assure low cabinet air temperature.
3. Low temperature rises at current carrying contacts combined with silver face surfaces insure no contact deterioration.
4. Power opening and power closing of contacts allow ample contact pressure at current carrying contacts.

In power generating stations, in subways, or aboard ship where Transfer Switches are continuously under load, obviously, a continuous rating is essential. But in industrial service, too, power and light requirements often greatly exceed 8 hours. Accordingly, good engineering practice demands a continuous duty switch.



Write for Publication 596 describing
how to select Automatic Transfer Switches.

Automatic Switch Co.

50-CC Hanover Road, Florham Park, New Jersey

FRontier 7-4600

ASCO®

located west of Fort Lauderdale, Fla., known as Plantation Isles.

GEORGIA

Hudson-Sheffer & Associates
Atlanta, Georgia

Industrial plant expansion, Atlanta, Ga. 7500 sq ft, reinforced concrete, structural steel, aluminum roof, hydraulic elevator. Client, Moca Coffee Co., Atlanta, Ga.

ILLINOIS

Suter & Sommerschild

Chicago, Illinois
Gymnasium expansion, Wheaton, Ill. Two 60- x 120-ft wings. (civil, struc., mech., elec.) \$400,000. Client, Wheaton College.

Church and parish house. 325,000 cu ft. (civil, struc., mech., elec.) \$375,000. Client, St. Paul's Episcopal Church of Hyde Park.

Smith & Tao

St. Louis, Missouri
St. Vincent's Seminary, Lamont, Ill. (struc., mech., elec.) \$130,000. Client, Ralph Ranft, Arch.

INDIANA

Jos. Rakowski
East Chicago, Indiana
Doctor's clinic, East Chicago, Ind. \$40,000. Client, Dr. John Nicosia.

Office building, East Chicago, Ind. \$38,000. Client, R. Mitchell & Son, Real Estate & Insurance.

Fink, Roberts & Petrie

Indianapolis, Indiana
Bearings plant and office building. (arch., civil, struc.) \$7,000,000. Client, Link Belt Co., Indianapolis, Ind.

Foundry. (struc., civil, arch.) \$4,000,000. Client, Link Belt Co., Indianapolis, Ind.

LOUISIANA

Irving B. Rau

New Orleans, Louisiana
Catholic church school building, Kenner, La. Foundations only. (struc.) \$145,000. Client, Grimbail-van-Amerongen, Arch., New Orleans, La.

Steel-framed residence, E. Lakeshore subdivision, New Orleans, La. (struc.) \$100,000. Client, Rock & Galloway, Arch., New Orleans.

MASSACHUSETTS

Gilbert Associates

Reading, Pennsylvania
Electrical power plant. \$3,800,000. Client, Municipality of Braintree, near Boston, Mass.

Hill & Percy, Engineers

Dalton, Massachusetts
Dairy and cattle breeding facilities. Two buildings, wood trusses, concrete block, 240- x 44-ft and 120- x 35-ft. (civil, struc., mech., elec.) Client, High Lawn Farm, Lee, Mass.

Stone screening system, Adams, Mass. (civil, struc., mech.) \$100,000. Client, New England Lime Co.

Ski lift and snow making facilities, Pittsfield, Mass. (civil, struc., mech.) \$150,000. Client, Bousquet's ski area.

MICHIGAN

William Lake & Associates

Muskegon, Michigan
Bowling alleys and bar, Muskegon, Mich. Client, Magnuson & Sumner.

Arthur H. Leach

Bridgeport, Michigan
Install 7611 lineal feet of cement water main and services. \$52,000. Client, Kelly-Cook, Inc., Detroit.

Prepare plans and specifications for 750-gpm, 12-in. dia. deep well, pumping station, and appurtenances. Client, Kelly-Cook, Inc.

Angelo J. Marino

Monroe, Michigan
Complete sanitary sewer system and disposal plant for entire lake area, Devils Lake and Round Lake, Lenawee County, Mich. In process of design 17 miles of sewer lines, 14 of which are in lake bottom with 35 lift stations. \$1,866,000. Client, Rollin and Woostock Townships, joint project.

MINNESOTA

Harold S. Hall

Alexandria, Minnesota
Street improvements. \$125,000. Client, Kensington, Minn.

Sewer trunk line and extensions. \$110,000. Client, Sauk Centre, Minn.

Water Mains, \$90,000. Client, Carlos.

I. F. Lane

Willmar, Minnesota
Motel and trailer coach court. \$50,000. Client, Ervin Wadsworth, Spicer.

MISSOURI

Williamson & Associates

St. Louis, Missouri
City-wide water works system. Wells, two elevated tanks, and distribution system. (civil) \$268,000. Client, City of Eureka, Mo.

Sanitary sewer system and sewage lagoon. (civil) \$133,000. Client, City of Benton, Mo.

Uri Seiden & Associates
Kansas City, Missouri

Two cottage dormitory buildings and chapel for Boys' Training School, Boonville, Mo. Concrete and steel framing. \$400,000. Client, Everitt & Keleti, Arch.

City hall and auditorium, Sedalia, Mo. Structural steel arches (exposed outside), precast concrete secondary members. \$500,000. Client, Everitt & Keleti, Arch.

Manufacturing building, steel frame on grade beams and piling foundation. \$150,000. Client, Associated Architects of Kansas City.

Allgeier, Martin & Associates

Joplin, Missouri
Sewage collecting system and sewage treatment facility. \$250,000. Client, Richland, Mo.

Sewage collecting system and sewage treatment facility. \$250,000. Client, Pleasant Hill, Mo.

NEW JERSEY

Henry I. Campbell, Jr.

Mineola, New York
Combined maintenance shop. Camp Kilmer Army Base, N.J. Preparation of final plans and specifications for mechanical and electrical facilities. (mech., elec.) \$1,700,000. Client, Architects, Raymond & Rado.

Wald & Zigas

Long Island City, New York
Kennedy-Sinclair office building, Montclair, N.J. (mech., elec.) \$160,000. Client, V. Gordon Carr, Arch.

NEW MEXICO

J. L. Breese & Associates

Santa Fe, New Mexico
Office building for United Western Minerals Co., Santa Fe, N.M. Heating, air conditioning, and plumbing. (mech.) \$100,000. Client, Wolgamood & Millington, Arch., Santa Fe, N.M.

NEW YORK

Henry J. Campbell, Jr.

Mineola, New York
New fire house, Huntington, N.Y. Complete new facilities. (mech., elec.) \$400,000. Client, Architect, Albert Graesser.

Dr. J. J. Polivka, Consulting Engineer

Berkeley, California
Belmont Sports Pavilion, New York, (struc.) \$16,000,000. Client, Harry Gigenheim, structural engineering for designer, Frank Lloyd Wright.

Hardesty & Hanover

New York, New York
Design of powerline expressway, 5-mile highway that is part of national system of interstate and defense high-



STAINLESS STEEL

... critical piping!

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TUBE-TURN
TRADE MARK

...a critical place to
safeguard your reputation
with "**TUBE-TURN**" products

Stainless steel piping is a specialist. It fights corrosion ... prevents product contamination ... performs under great temperature extremes ... is able to handle dangerous materials safely. Construction and maintenance dollars, often the safety of life and property, and *your reputation* are at stake in the selection of these materials.

When you specify TUBE-TURN® Stainless Steel Fittings and Flanges, you get extra-value features and greater strength at no extra cost. Fittings are marked with *complete* identification. Production procedures and quality control assure conformity to all code requirements.

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You get these extra values
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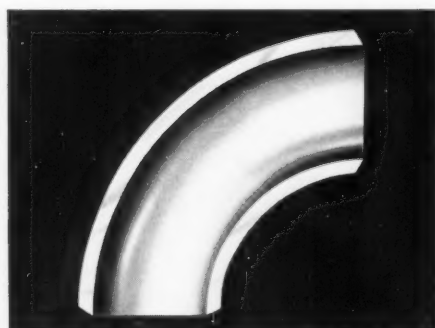
Stainless Steel Fittings

- Fittings meet *all* standard chemistry specifications
- Minimum wall thickness of elbows are at least 87½% of nominal
- All fittings meet calculated bursting pressure of matching pipe
- Qualified welders and procedures used where welding is required
- Each fitting properly solution heat-treated
- Each fitting passivated
- Special grades of stainless steel, and all other alloys available

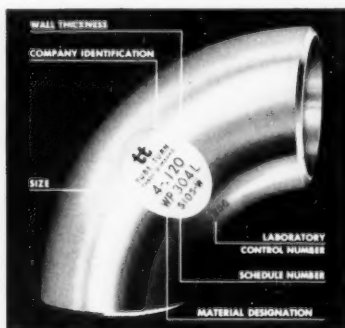
Meet all codes: ASTM A403 (for material and manufacturing procedure); MSS SP43 and ASA B16.9 (for dimensions); and MSS SP25 (marking procedure).



TUBE-TURN Stainless Steel Elbows and Tee in a petrochemical plant.



UNIFORM WALL. Fittings meet ASA standards of 87½% of nominal thickness . . . particularly important for light wall elbows. Many conventional stainless steel elbows are as much as 30% to 40% below nominal at this point of greatest wear. All TUBE-TURN® Stainless Steel Fittings, including tees, match calculated bursting strength of the pipe.



COMPLETE IDENTIFICATION. You know this fitting conforms to specified quality because the material type and quality control are fully identified. Manufacturer, size, wall thickness and schedule are also marked as shown on the fitting.



CUTS PURCHASING COSTS. You can order TUBE-TURN Stainless Steel Fittings from your nearby Tube Turns® Distributor . . . on the same order as other types of welding fittings in Tube Turns® line of 12,000 products. Cuts red, tape. Saves time. Photo courtesy McJunkin Corporation, Charleston, W. Va.

STAINLESS STEEL CATALOG—Complete information on properties, application, standards, welding procedure and all types of TUBE-TURN Stainless Steel Fittings and Flanges. Mail coupon for your free copy.



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DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Detroit • Atlanta • New Orleans • Houston • Midland • Dallas • Tulsa • Kansas City • Denver • Los Angeles • San Francisco • Seattle. **IN CANADA:** Tube Turns of Canada Ltd., Ridgetown, Ontario • Toronto, Ontario • Edmonton, Alberta • Montreal, Quebec • Vancouver, British Columbia.

ways, in Amherst, Erie County, N.Y. (civil) \$10,000,000. Client, Department of Public Works.

Donald E. Stearns, P.E.
Cazenovia, New York
Southwood-Jamesville County Water District. \$350,000. Client, Onondaga County Water Authority, Syracuse, New York.

Hartlot Water District. \$120,000. Client, Town of Elbridge, N.Y.

Wald & Zigas
Long Island City, New York
Berkshire Service Area, New York State Thruway Authority. Two restaurants, two gas stations, sewage treatment plant. (mech., elec.) Client, Samuel S. Adlerstein, Arch.

IBM Recreation Center, Kingston, N. Y. (mech., elec.) Client, Raymond & Rado, Arch.

OHIO

Ayers & Graf
Cincinnati, Ohio
5-mile sanitary sewers. (civil) \$225,000. Client, City of Wyoming, Ohio.
6.8-mile sanitary sewers. (civil) \$350,000. Client, Village of Blue Ash, Ohio.

Helmig Lienesch & Associates
Dayton, Ohio
Revision of boiler plant, University of Dayton, Dayton, Ohio, including two new generators of 600 hp each and one new generator of 125 hp, with deaerator, feed pumps, etc. (struc., mech., elec.) \$200,000. Client, University of Dayton, Dayton, Ohio.

OREGON

Stan H. Lowy & Associates
Portland, Oregon
Galvanizing plant. (struc., mech., elec.) \$30,000. Client, City of Portland, Ore., City Galvanizing Co.
Fuel house, cyclone support with conveyor, for U.S. Plywood Corp. (struc.) \$25,000. Client, Industrial Machine & Pump Co., Medford, Ore.

Ray W. Preston
Oswego, Oregon.
Sam Case Elementary School, Newport, Ore. Electric heating. (elec.) \$90,000. Client, Annand, Bonne & Lei, Arch.

Medford Airport, Medford, Ore. Runway lighting. (elec.) \$65,000. Client, City of Medford.

Park Rose Junior High School, Portland, Ore. New fireproof design. (elec.) \$77,000. Client, Annand, Bonne & Lei, Arch.

Seaside High School, Seaside, Ore. (elec.) \$85,000. Client, Annand, Bonne & Lei, Arch.

High school addition, Toledo, Ore. (elec.) \$60,000. Client, Annand, Boone & Lei, Arch.

PENNSYLVANIA

Gustav Stueber
Pittsburgh, Pennsylvania
Phillips Elementary School, Pittsburgh, Pa. (struc.) \$600,000. Client, Rigamont and Steen, Arch., Pittsburgh, Pa.

Walter E. Spotts and Associates
Reading, Pennsylvania
Construction of new concrete reservoir and three miles of cast iron transmission main. (civil) \$250,000. Client, Borough of Strasburg, Lancaster County, Pa.

Construction of new cast iron transmission main from reservoir to borough. (civil) \$75,000. Client, Borough of Fleetwood, Berks County, Pennsylvania.

Buchart Engineering Corporation
York, Pennsylvania.
Hannah Penn Junior High School. Design and preparation of structural drawings for new school. Concrete and structural steel design with 170-ft circular wood arch span for auditorium and bandroom. Building foundations on caissons. (struc.) \$1,525,000. Client, Buchart Assoc.

Winber High School addition. Prepare design, specifications, and structural plans for addition to existing high school. Steel structure. \$1,150,000. Client, Buchart Assoc.

Southwestern High School. Prepare design, specifications, and structural plans. Steel structure. (struc.) \$1,000,000. Client, Buchart Associates.

Six buildings for Pennsylvania State College expansion program. Prepare design, specifications, and structural plans. Concrete and steel design. (struc.) \$3,074,000. Client, Buchart Associates.

Windsor Township Elementary School. Prepare design, specifications, and structural plans. Steel structure. (struc.) \$97,000. Client, Buchart Associates.

SOUTH CAROLINA

J. C. Harrison
Spartanburg, South Carolina
Spartanburg Senior High School. (mech.) \$3 million. Client, City of Spartanburg, S.C.

Draytonville elementary school. (mech.) \$250,000. Client, Cherokee County, S.C.

Self Memorial Hospital addition, Greenwood, S.C. (mech.) \$500,000. Client, Self Memorial Hospital.

TENNESSEE

Frederic R. Harris, Inc.
New Orleans, Louisiana
Design of new maintenance and repair depot to serve dredges and river equipment, with pier, shops, warehouses, roadways, highway bridge, and railroad facilities at Memphis, Tennessee. (civil, struc., mech., elec.) \$2,000,000. Client, U.S. Corps of Engineers.

TEXAS

Forrest and Cotton
Dallas, Texas
Toledo Bend (civil) \$40,000. Client, Sabine River Authority of Texas and Louisiana.

Central sewage plant. (civil) \$7,365,000. Client, Trinity River Authority.

Cooper reservoir and channel improvements on Sulphur River above Texarkana reservoir. \$14,000,000. Client, Corps of Engineers, U.S. Army.

Feasibility report for dam and reservoir on Jim Ned Creek. \$1,400,000. Client, City of Coleman.

Iron Bridge. (civil) \$20,000. Client, Sabine River Authority of Texas.

Halsey & Royer
San Antonio, Texas
St. John's Church addition. (mech., elec.) \$30,500. Client, Julian & White, Architect.

San Antonio Music Co. (mech., elec.) \$236,308. Client, Julian & White, Arch.

Hilton Hotel electrical changes. (elec.) \$250,000. Client, Ayres & Ayres.

Light Publishing Co. press wiring. (elec.) \$75,000. Client, Owner.

UTAH

J. F. Heath
Salt Lake City, Utah
Heating plant. (struc., mech., elec.) \$100,000. Client, St. Marks Hospital.

Addition to hospital power plant. (struc., mech., elec.) \$200,000. Client, Church of Jesus Christ of Latter-day Saints.

Additions to heating plant. \$300,000. Client, University of Utah.

John A. Carollo, Consulting Engineers
Phoenix, Arizona
Design and supervision of construction of water treatment plant for water supply from Deer Creek Division of Provo River project and City of Salt Lake, Utah, from Little Cottonwood Creek. (civil) \$7,100,000.

EVERY ENGINEER will want a copy of this NEW BULLETIN

BULLETIN No. 31



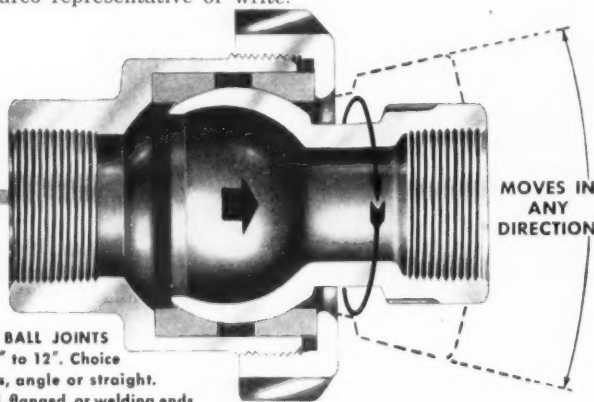
HOW TO SOLVE

PIPE EXPANSION PROBLEMS

CERTAIN distinctive characteristics and features make Barco Flexible Ball Joints particularly well-suited for solving many present-day plant piping design problems, especially for *Steam Service*:

1. Ability to handle compound movement (where twisting is combined with thermal expansion and contraction).
2. Virtually no deterioration. Able to stay in service for years without repairs or maintenance. No lubrication.
3. No heavy pipe anchoring required. No "end thrust" developed under pressure. Minimum space needed for installation.
4. Maximum safety for high temperature applications. All-metal construction available. Special metals can be specified.
5. Basic design is pressure sealing against leakage and self-adjusting for wear. Suitable for steam pressures to 750 psi and higher.
6. Easy to engineer joints into piping to provide for any degree of flexibility, expansion, or movement required.

New Bulletin No. 31 contains interesting diagrams showing how to solve many common pipe expansion problems EASILY, ECONOMICALLY. Ask for a copy; see your nearest Barco representative or write:



BARCO BALL JOINTS
Sizes $\frac{1}{2}$ " to 12". Choice
of styles, angle or straight.
Screw, flanged, or welding ends.



BARCO MANUFACTURING CO.
572B Hough Street • Barrington, Illinois

The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Revolving Joints
In Canada: The Holden Co., Ltd., Montreal

Client, Salt Lake City Metropolitan Water District.

WASHINGTON

R. E. Layton & Associates
San Leandro, California
Preparation of plans and specifications for Beverly Park tank. Two million gallons capacity, elevated. Prestressed, precast concrete water storage reservoir. \$300,000. Client, City of Seattle, Washington, Water Department.

Kane & Ervin
Seattle, Washington
Hospital, Seattle, Wash. (struc., mech.) \$1,250,000. Client, Al Simonson, Arch. for Lake Burien Hospital Association.

School. (mech.) \$650,000. Client, Paul Thiry, Arch., Seattle School Board, Owner.

School. (mech.) \$550,000. Client, Dan Miller, Arch.

Bowling alley. (struc., mech.) \$250,000. Client, Tony Gonzales.

Carey & Kramer
Seattle, Washington
New sewerage system and program. Sewer lines and stabilization pond (lagoon). (civil, struc., mech., elec.) \$525,000. Client, Snohomish, Wash.

WYOMING

K. J. Murray
Denver, Colorado
Addition to VA Hospital, Cheyenne, Wyo. \$2,000,000. Client, Porter & Porter, Cheyenne, Wyo.

Wyoming State highway office building, Cheyenne, Wyo. \$1,850,000. Client, Sam Hutchings, Cheyenne.

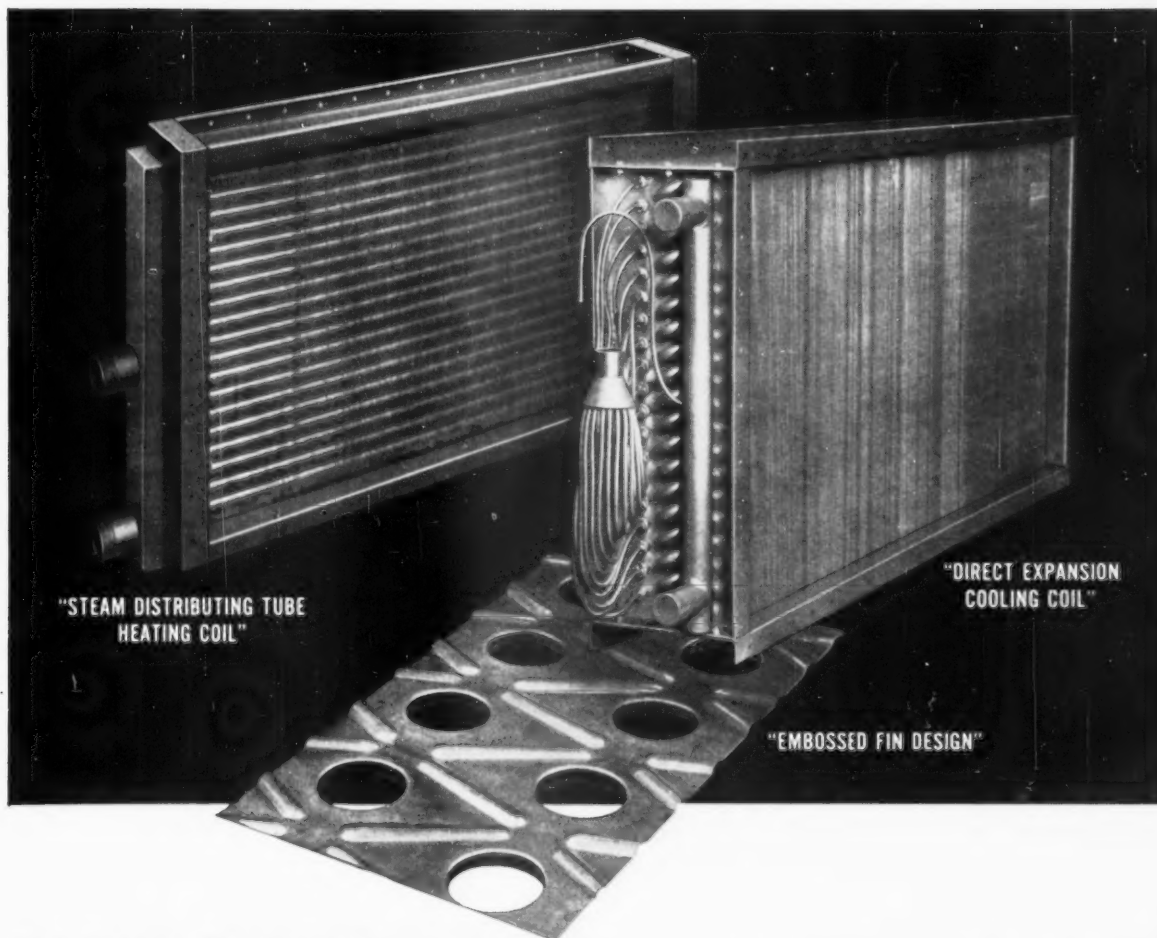
FOREIGN

Hill & Percy, Engineers
Dalton, Massachusetts
Bagasse pulp mill, Brazil. (civil, struc., mech., elec.) \$2,500,000. Client, Noble Wood Mach. Co.

Herbert Manuccia, P. E. and Associates
600-unit Armed Services housing project, Hickam Air Force Base, Territory of Hawaii. (civil, struc.) \$10,000,000. Client, U. S. Air Corps and Groll, Beach & Assoc., Arch., Washington, D. C.

Adrian Wilson & Associates
Los Angeles, California
Pipeline — (POL). (civil, struc., mech., elec.) Client, Turkey. ▲▲

CONSULTING ENGINEER



DEAD AIR IS A DUD...and a costly one!

Dead-air film on smooth fin surface prevents maximum heat transfer!

GET PURCHASED PERFORMANCE! . . . Use Westinghouse Heat Transfer Surface with its air-activating fin design—prevents dead-air film!

All Westinghouse Continuous Plate-fin Coils feature:

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And for Heavy Duty—Industrial-Process and High-Pressure applications . . . standard sections with extra-heavy wrought iron finned pipe!

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YOU CAN BE SURE...IF IT'S Westinghouse

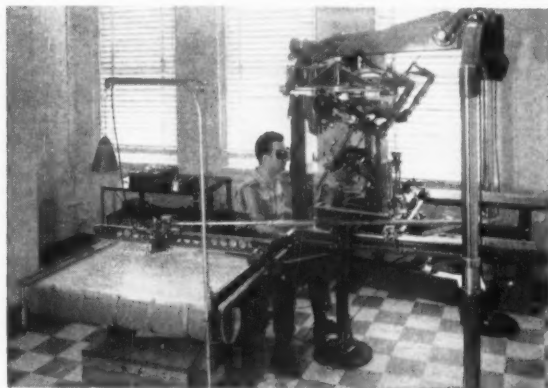


News for the Consultant



Stereographic Machine Reduces Work of Survey Parties

Rader and Associates, Miami, Fla., have installed a stereocartograph machine for use in aerial surveying and mapmaking. Accurate enough to plot contours to 1/10th of a foot from photographs taken at an altitude of 1000 feet, this machine greatly re-



NEW STEREOCARTOGRAPH MACHINE AT RADER & ASSOC.

duces the work that formerly was done by survey parties in the field. Besides making a more detailed map than is possible from survey party notes, the machine can draw any size map desired, from 1/16th the size of the picture to 25 times larger. The machine is one of only five of this type in use in the United States.

News Building Addition And Modernization Under Way

Site preparation is under way for an air-conditioned 18-story addition to the 37-story structure at 220 East 42nd St., New York City, which will provide approximately 270,000 square feet of space to help meet the need of midtown office locations.

The addition is part of a \$20 million modernization and expansion program which will increase the existing 663,700 square feet in the two Manhattan

buildings of *The News* more than 50 percent to 1,009,700 square feet. Completion date for the addition is June 1, 1959.

The new building will extend from *The News* building east on 42nd St., 220 feet to the corner of Second Ave. and will connect with the original building on each floor at the elevator lobby.

Two other projects are being pushed more or less simultaneously. One is erection of five additional stories over the nine-story plant section that forms a rear east wing of the main *News* building. The second is construction of two stories above *The News'* 2½-story garage, which runs from 228 to 240 East 41st St., directly behind the main plant. The garage extends back to 40th St.

As part of the program an extensive modernization of the tower section and part of the plant wing of the 27-year-old building is under way, including air-conditioning, acoustical ceilings, and fluorescent lighting.

The addition will provide a dramatic new change in the 42nd St. building line. It is planned to harmonize with the existing Raymond Hood-John Mead Howells designed building which gained worldwide attention in 1930 as the first straight-line office building. From the third story up, the addition will be set back 40 feet from the building line along 42nd St. to conform with the clean lines of the structure.

Projecting splayed piers with a brick face and aluminum sides will emphasize the strong verticality of the combined new building. Architects Harrison & Abramovitz have selected new gray-white bricks to match the old ones. Windows will be the pivoted-reversible type hung in aluminum frames. The lower two stories, to be used as bank and store space, will be enclosed in glass and metal. Eight new passenger and one new freight elevator will be installed.

The corner site will be excavated to a level approximately 30 feet below the street for a sub-basement to provide greater storage area. This also will make possible a direct entry from the building

Another modern church chooses Steel Pipe Radiant Heating



Steel Pipe Radiant Panels in main auditorium, 1" standard black pipe on 12" centers.

Perimeter of building, 1 1/4" standard black pipe on 6" centers with 1 1/2" headers.

While the beautiful churches of yesteryear are loved and admired, the need for more, but less pretentious, suburban churches has brought a fresh architectural concept to these.

In modern church construction, comfort, practicality and all-week usefulness are keystone factors. An adequate kitchen may rank with auditorium acoustics in importance. Certainly steel pipe radiant panel heating and sidewalk snow melting are part of today's suburban church planning.

In this Pueblo, Colorado, Christ the King Catholic Church, as in many others, a steel pipe radiant panel heating system will provide perfect, draft-free comfort for 9120 square feet of floor area.

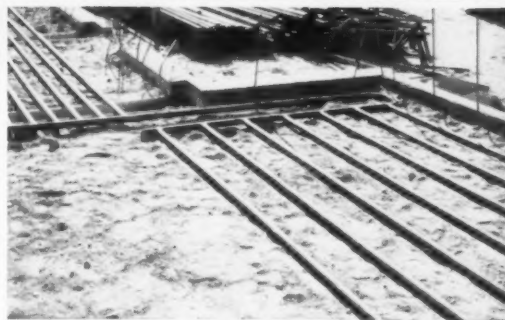
Yes, steel pipe is first choice for radiant heating . . . as it is for snow melting, plumbing, fire protection systems, electrical conduit, gas, steam and air transmission lines, and structural pipe applications. Steel pipe gives the ultimate in service for every dollar spent!

Committee on
STEEL PIPE RESEARCH

AMERICAN IRON AND STEEL INSTITUTE

150 East Forty-Second Street, New York 17, N. Y.

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is First Choice**



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"Radiant Panel Heating with Steel Pipe"

Only Steel Pipe gives all these advantages!

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- Strength unexcelled for safety
- Formable—bends readily
- Weldable—easily, strongly
- Threads smoothly, cleanly
- Sound joints, welded or coupled
- Grades, finishes for all purposes
- Available everywhere from stock

to the proposed Second Ave. subway, when built.

The bridge, more than 15 feet above street level, will have glassed-in sides, allowing pedestrians to watch the printing of the newspaper.

Trucks will move to and from storage floors via a ramp system, with entrance and exit doorways on 41st St. Shifting the newsprint delivery trucks to 40th St. will help lessen congestion in 41st St.

On the roof of the garage will be a chilled water plant for air-conditioning the entire building group. Two 18-in. pipes will cross 41st St. in the roof of the bridge and will carry chilled water to fan rooms in the main building and annex.

Engineers are Meyer, Strong & Jones, mechanical engineers, and Lockwood-Greene, structural engineers and newspaper operation consultants. Turner Construction Co. is general contractor.

Underground Garage Planned for Newark

Frank Grad & Sons, Architects and Engineers, of Newark, N.J., have completed design for a proposed three-level garage under Military Park, in downtown Newark. The 1003-car, \$6,060,000 garage plan is under study by the city Parking Authority

as part of an over-all project for a comprehensive off-street parking program to match a local building boom in the downtown area.


Plans call for a reinforced concrete structure with a total floor area of 384,102 square feet, 270,810 of which would be available for parking. Roof of the structure would be four feet under the ground level of the Park, which would be completely rehabilitated after completion of the underground garage. An exhaust system would provide ten complete air changes an hour.

Motorists would park their own cars, with an elevator, escalators, and stairways providing access to the street level. First tier of the structure would house a waiting room, offices, and lounges.

The survey of parking problems in the downtown area is being conducted by the Ramp Buildings Corp. of New York. Ramp also will pass on the economic feasibility of the garage.

Trickling Filter Treatment Under Study in Washington

The Industrial Research Department of Washington State Institute of Technology began a long-range sewage treatment study in the summer of 1955



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Stand-by power...safeguard for public buildings, factories, institutions

When storms or accidents cut off central station power, Kohler stand-by electric plants take over critical loads automatically. They afford low-cost insurance against hazard or loss.

In club or school swimming pools, Kohler stand-by plants prevent sudden darkness that may cause panic and disaster—also in stores, theatres, auditoriums. Hospitals need them for lighting and equipment essential to patients' treatment and care. They prevent costly interruptions for hatcheries; greenhouses; factories; industrial automation; office buildings; railroads; airports.

Complete manual, including suggested specifications, will be sent on request. Sizes from 500 watts to 50 KW, gasoline... 10 KW to 80 KW, diesel. Write Dept. A-7.

KOHLER Co. Established 1873 KOHLER, Wis.

YMCA at Milwaukee, Wisconsin has a 35 KW Kohler stand-by plant.

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Visit the Kohler exhibit, Associated Equipment Dealers Annual Meeting, Chicago, Jan. 26-30

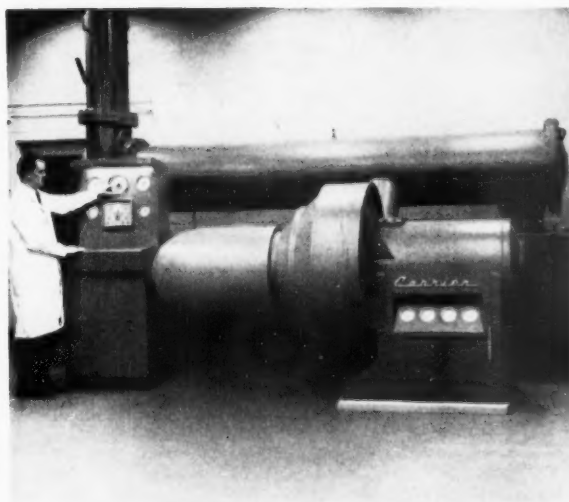
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EVERYWHERE

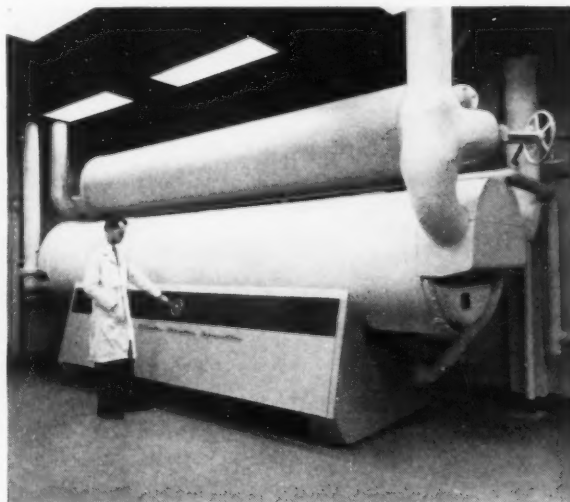


Which way is best to air condition a building?

Every building poses different problems. Take the refrigerating machine, for example. Where should it be located? What kind of power is available? How much tonnage do you need? Carrier builds every type of refrigeration for air conditioning. Two of the many types are shown below. Each provides unique advantages under special conditions. Each has been proved practical and dependable in installation after installation. For complete information about them, call your nearest Carrier office. Or write Carrier Corporation, Syracuse, New York.



If you have low-cost electric power, the new Carrier Hermetic Centrifugal Refrigerating Machine offers unmatched advantages. It's the only hermetic with such advanced features as refrigerant-cooled motors through the entire capacity range, hydraulic powered capacity vanes, and electronic controls for completely automatic operation. Its compact design and light weight minimize space and structural requirements. In 28 sizes—90 to 1100 tons. Other Carrier Centrifugals up to 4000 tons. For smaller buildings, there are "packaged" Carrier Reciprocating Water Cooling Machines from 3 to 200 tons.



If you have low-cost steam, the best way may be a new Carrier Absorption Refrigerating Machine. It cools with heat energy derived from low-pressure waste steam or hot liquids to cut costs. Operates automatically at the push of a button. Follows fluctuating loads electronically from full load to zero capacity. It's safe—with water the refrigerant, a simple salt the absorbent. And it's so compact and vibration-free you can locate it wherever there's room to spare—on the roof, in the basement or anywhere in between. In thirteen sizes with cooling capacities ranging from 60 to 700 tons.

to determine trickling filter performances as affected by depth and hydraulic loading. The project is in cooperation with the city of Pullman, Wash.

In the trickling filter system, a bed of coarse rock is sprayed with liquid sewage that has been through a primary treatment involving removal of large objects, floating matter, and grease. A slimy bacterial growth coating the rocks removes the organic matter leaving a clear liquid, odor-free, with a low B.O.D. (biochemical oxygen demand). Since organic matter in decomposing consumes the dissolved oxygen, the B.O.D. of untreated sewage is high and produces unpleasant odors. The trickling filter emulates the self-cleansing action of streams. This purification action of streams used to be considered sufficient treatment for sewage. Now it is known that treatment methods must relieve the stream of this burden in order to prevent pollution.

For purposes of research, a 10-ft cylinder enclosing a trickling filter five feet in diameter with a bed of stone 10 feet deep was constructed at the Pullman Plant. Sampling tubes are located at every foot of depth. Liquid from the City's settling tank is pumped to a weir box where the flow to the test filter is controlled. It then flows to a rotary distributor and, after passing through the test filter, is returned to the treatment plant's influent line.

Since depth or rocks in filter systems has been an arbitrary matter, it is hoped data will be secured in determining proper depth as well as the most efficient rate of application of the liquid sewage to the bed of stone. Rate of application is measured in millions of gallons per acre per day. Generally the B.O.D. of the liquid when it leaves the filter should be reduced to 15 percent of the original B.O.D.


The City of Pullman has furnished the tanks for the project as well as power for research.

Canada, Great Britain, and U. S. Work Toward International Drafting Standards

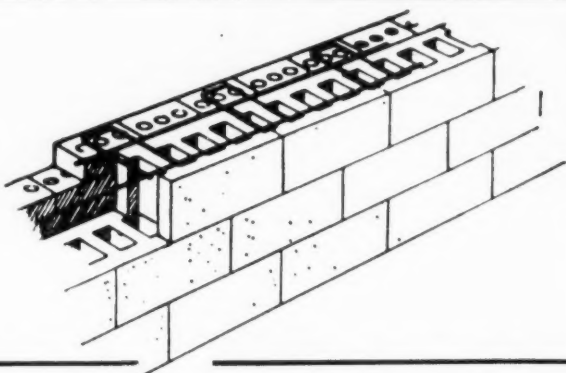
A conference called by the national standards bodies of Canada, Great Britain, and the United States met in Toronto, Canada, in October to achieve a tripartite international accord on drafting practices.

The American Drafting Standards Manual, four sections of which have been approved by the American Standards Association and are being published by The American Society of Mechanical Engineers, provided the basis for the U.S. delegates in presenting the U.S. viewpoint.

When completed, the manual will consist of seven-



**NEW
ECONO-LOK***
(FLUSH-WELDED
MASONRY
REINFORCEMENT)



**TRUE COPY OF
ARMOUR RESEARCH
FOUNDATION
TEST**

CONSTRUCTION	WALL TIE	TOTAL TRANSVERSE LOAD POUNDS					MODULUS OF RUPTURE psi AVERAGE
		1	2	3	4	5	
4" Brk. & 4" Blk.	Header	2600	2500	2300	1800	1400	31.1
4" Brk. & 4" Blk.	Econo Lok 3/16"	5000	—	6400	3800	5200	74.6
4" Brk. & 4" Blk.	Econo Lok No. 9	4400	5400	6800			81.1

Transverse tests show Econo-Lok tied walls are 2½ times stronger than header tied walls.

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BLOK-LOK . . . Flush welded ladder design, for controlling shrinkage cracks in concrete masonry. Also used in all types of masonry to add lateral strength and strengthen weak points.

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CAVITY-LOK* . . . Employs principle of earth-quake design, by reinforcing and tying both wythes of a cavity wall in one operation.

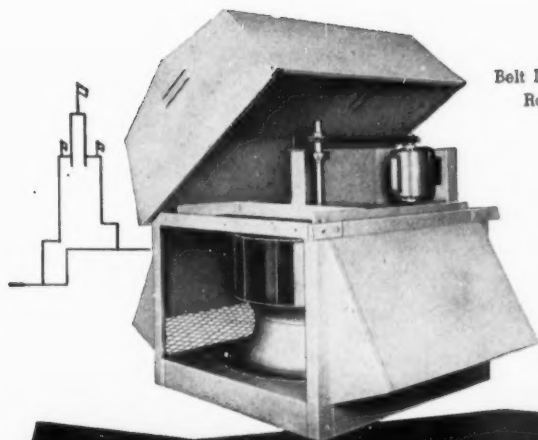
ECONO-LOK CAVITY* . . . Econo-Lok design made for cavity walls. Reinforces the backing as it ties the facing.

'Z' BARS AND RECTANGULAR TIES . . . Conventional ties made in 6" and 8" lengths for both cavity and solid walls.

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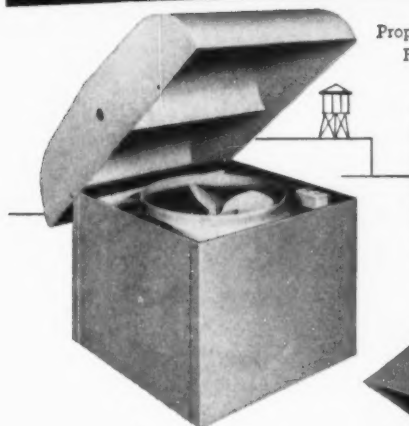
*Pat. Pending © 1957 AA Wire Products Co.



Belt Drive Centrifugal
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Recommended for their high quality, ease of installation, low maintenance cost, trouble-free operation, space-saving features, and blower-like performance.

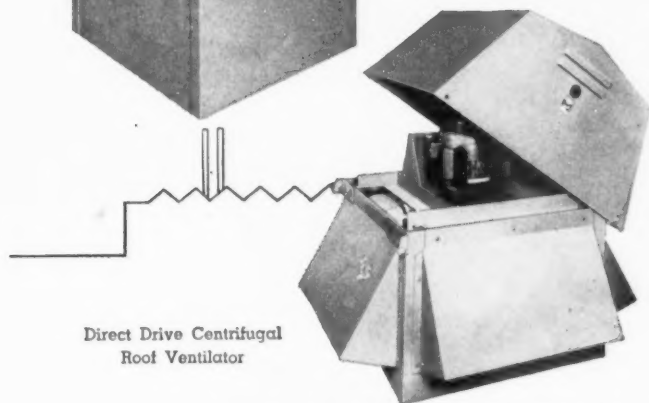
Peerless Electric Roof Ventilators . . .



Propeller-Type Power
Roof Ventilator



Peerless Electric Roof Ventilators offer engineers, architects, contractors and users PFMA rated units that embody sturdiness, high performance ratings, and low noise levels. They are particularly suited for public buildings, industrial plants, hospitals, churches, schools, and other similar applications.

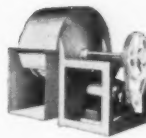
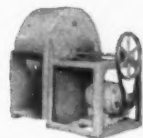


Direct Drive Centrifugal
Roof Ventilator

Sizes range from 12" to 60" wheels; 640 to 45,000 c.f.m., depending upon the unit selected. Peerless Electric Roof Ventilators are built of 16 gage steel, or heavier, to last the life of the building. They fit all standard curb sizes. Matching wheel cones accurately fit venturi inlet for quieter operation . . . smoother air movement.

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teen sections, each individually approved as American Standard by the ASA. The sections approved to date are: Section 1, Size and Format; Section 2, Line Conventions, Sectioning, and Lettering; Section 3, Pictorial Drawings; and Section 4, on Dimensioning and Notes. Section 5 and comparable portions of the British and Canadian Standard comprise the only major area in which serious differences still exist. The prime purpose of the Toronto meeting was to chart a path for reconsidering such differences. The standards work in each country demands that all parties-at-interest subscribe to the objectives the conference sets before modifying the national standards.

The American Society of Mechanical Engineers and the American Society for Engineering Education have provided the administrative leadership of the ASA Committee on Drawings and Drafting Practice. Technical representatives of 29 national organizations from industry, engineering societies, and educators, and the military services have been engaged for nearly ten years in a drive to develop standards of national acceptability.

Objective of the American delegation was to carry the work one step further — to reach an accord with Great Britain and Canada. Discussions revolved around areas of agreement and disagreement in the drafting practice of each country. Particular attention was directed to the specification of true positions and geometric tolerances and maximum material conditions on drawings. The use of symbols to express geometric forms also was discussed.

The last major ABC accord in the field of engineering standards was reached in 1948 and resulted in a unified screw thread system based on the inch. The British, at that time, abandoned their historic Whitworth (55°) thread in favor of the American 60° thread.

Sub-Surface Drains Control High Ground Water

With the grading operations nearly completed and the foundations under construction, the building of the \$12 million El Serrito (Calif.), Shopping Center is well under way. Target date for the opening is the spring of 1959.

Welton Becket & Associates are the architects for the Center's \$5 million Capwell store. Hammarberg & Herman are the over-all project architects as well as designers of the site plan and the other top quality stores and specialty shops. Civil engineers for the project are Bryan & Murphy; Robinson & Giddings are the structural engineers for Capwell's.

Consulting civil engineers Woodward, Clyde & Associates, who handled the soils investigation, recommended extensive sub-surface drains because of a high ground water condition. Complete site utili-

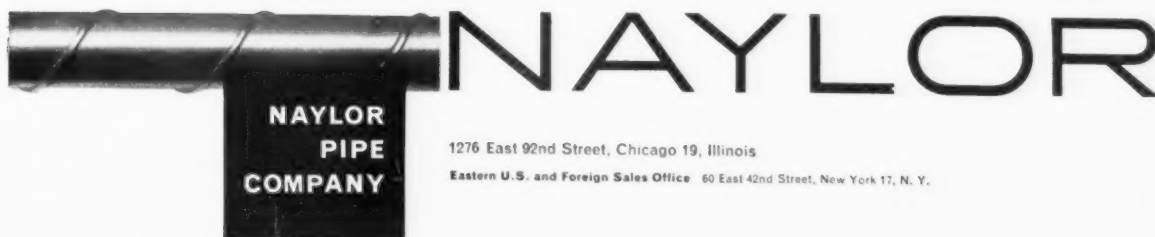
CONSULTING ENGINEER



Takes AIR To Build Tunnels

When air is a construction ingredient, it pays to carry it through lines of dependable NAYLOR spiralweld pipe. It's the one lightweight pipe built to give you heavy-wall performance. It's extra strong and safe—easier to handle and faster to install, especially with the one-piece NAYLOR Wedgelock coupling. It's a wise choice for ventilating lines or pressure lines for pneumatic equipment.

Write for Bulletin 507 which tells the complete story.



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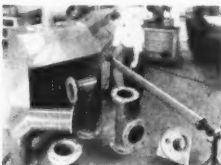
Specializing in intricate, heavy parts; metal inserts molded in.

✓ **HARD RUBBER, CUSTOM MOLDED**



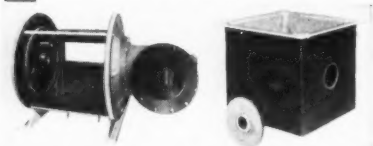
New uses, new compounds of this reliable chemical-resistant material.

✓ **PVC FABRICATIONS & ROLL COVERING**



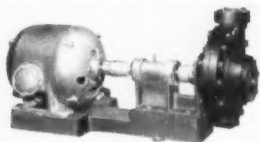
Unlimited applications and versatility for this fine plastic—rigid polyvinyl chloride.

✓ **HARD RUBBER & PVC LINING**



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New mechanical seal eliminates usual packing troubles.

✓ **PVC & HARD RUBBER PIPE, FITTINGS & VALVES**

PVC sizes 1/4" to 12", temperature to 140° F. Hard rubber sizes 1/4" to 8", temperature to 225° F. in heat-resistant Buna-N.



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zation was provided by recompacting 100,000 cubic yards of earth in the grading operation.

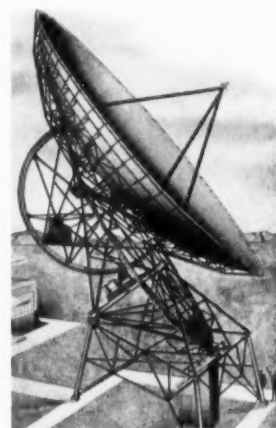
The 31-acre El Cerrito Center can easily accommodate more than 200,000 shoppers, with parking area for 2500 cars. The smaller stores and shops are concrete and frame structures while Capwell's will be built of poured-in-place reinforced concrete.

The Welton Becket designed store is keyed to immediate needs and ease of future expansion. Unobstructed floor space is accomplished through the use of long trusses. Narrow steel columns rather than solid exterior walls guarantee the maximum open area for arranging or changing show windows.

Michigan's Radio Telescope To Be Completed for IGY

Under a contract with the Office of Naval Research, the Tower and Antenna Department of Blaw-Knox Co. has designed an 85-ft-diameter radio telescope for the University of Michigan. It will be completed by early next summer, in time to contribute data for the International Geo-Physical Year.

The radio telescope will be mounted with its polar axis pointed at the North Celestial Pole. The reflecting dish is to be supported from the top spoke of a large polar wheel that moves east to west to



THE 85-FOOT-DIAMETER RADIO TELESCOPE TO BE BUILT FOR THE UNIVERSITY OF MICHIGAN WILL LOOK LIKE THIS.

compensate for the rotation of the earth. The reflector also rotates about a shaft mounted at the ends of two spokes of the polar wheel.

Unlike the alt-azimuth type of instrument — a two-towered installation with dish between — which requires two coordinated drives, Michigan's telescope will track with a single drive. It will be possible to operate the instrument for precise measurement in winds of 45 mph.

The design is a result of experience gained in design of structures for the DEW Line, the White Alice Communication System, and other communi-



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George L. Dahl Architects and Engineers
Dallas, Texas

General Contractor
R. P. Farnsworth & Co., Inc.
New Orleans, La.

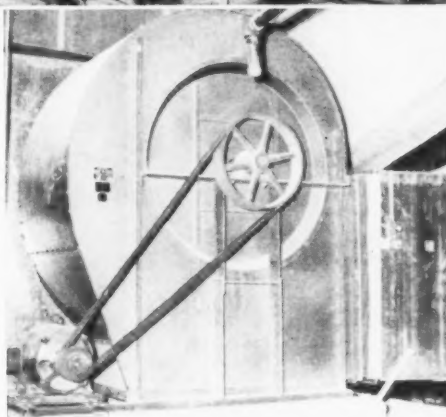
Plumbing, Heating, Air Conditioning
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Dallas, Texas

Another Coliseum Chooses Clarage Air Handling and Conditioning Equipment

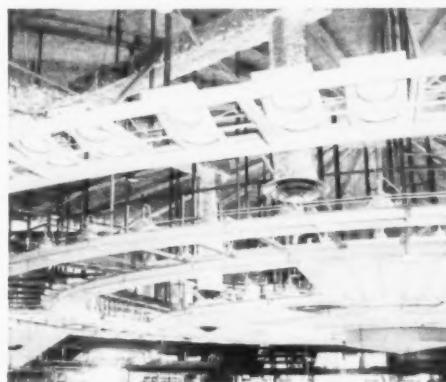
IMPRESSIVE in the Texas tradition is the new Dallas Memorial Auditorium. Its circular arena building, reportedly the largest cement domed structure in the nation, connects with a convention building and lyceum, shown on the right above.

Air handling throughout this vastness was assigned to Clarage equipment—Multitherm conditioning units, Unicoil sprayed coil units, giant system fans, ventilating sets.

Here again, as in New York's new Coliseum and other prominent buildings of all types, Clarage equipment was chosen for its recognized ability to perform quietly, economically, and dependably. CLARAGE FAN COMPANY, Kalamazoo, Mich.



One of several Clarage Type NH fans located in the outer ring which encircles the Coliseum's dome.

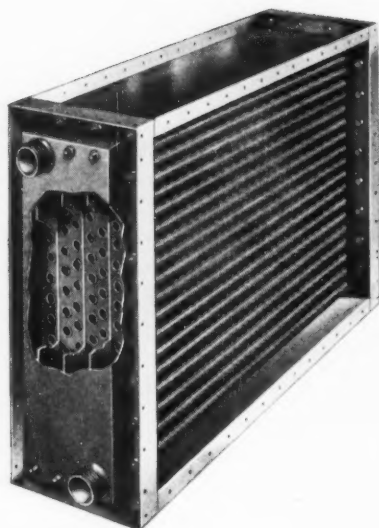


Arrangement of air conditioning ductwork, viewed before completion of the ceiling.

CLARAGE

...dependable equipment for
making air your servant

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal



AEROFIN

TYPE R REMOVABLE HEADER WATER COILS

- **Complete Drainability**
- **Easily Cleaned**
- **High Heat Transfer**

Completely drainable and easily cleaned, AeroFin Type "R" coils are specially designed for installations where frequent mechanical cleaning of the inside of the tubes is required.

The use of $\frac{3}{8}$ " O.D. tubes permits the coil to drain completely through the water and drain connections and, in installations where sediment is a problem, the coil can be pitched in either direction. The simple removal of a single gasketed plate at each end of the coil exposes every tube, and makes thorough cleaning possible from either end.

The finned tubes are staggered in the direction of air flow, resulting in maximum heat transfer. Casings are standardized for easy installation. Write for Bulletin No. R-50.

AEROFIN

CORPORATION

101 Greenway Ave., Syracuse 3, N.Y.

AeroFin is sold only by manufacturers of fan system apparatus. List on request.

cations and defense installations in the Arctic, the Pacific, and in Cuba.

Milwaukee Approves Parking Program for Congested Industrial Areas

A program for development of employee parking in industrial areas, formally approved by the Milwaukee, Wis., City Parking Commission, is designed primarily to relieve parking problems in older areas of the city. As a result of the program, it is hoped that some firms which might otherwise leave the city will be encouraged to stay.

Milwaukee has been concentrating on development of off-street parking lots in commercial and residential areas and in a program of downtown parking pavilions.

The commission's employee parking plan would commit the city to aid industries with parking problems by:

- Installing two-hour parking restrictions on one side of streets near plants and unlimited parking on the other side. Both sides of streets near factories now are posted with two-hour restrictions.
- Installing 10-hour, 25¢ meters on some nonresidentially zoned streets near factories.
- Constructing off-street employee parking lots "where necessary" after the on-street parking regulations have been introduced.

If parking lots are constructed under the commission's plan, their cost would not impose a burden on the general taxpayer. There would be a charge for parking in the lots, probably 25¢ a day. Such revenue, plus the returns from the 10-hour street meters, would be applied to the cost of the industrial lot for 15 years after its completion. The remainder of the cost, if any, would be assessed against the benefited industry.

The city would wait until an industry asked for aid before a parking plan was tailored to suit it. No industry could be offered the help of the city unless it agreed to the installation of the 10-hour meters adjacent to its plant.

Why Computers Cannot Compete With Men as Language Translators

When it comes to translating a foreign language with a computer, the electronic brain can remember only about one millionth as much as the human brain, according to data collected by Robert E. Wall, Jr., and Udo K. Niehaus, of the University of Washington, Seattle.

In the paper "Russian to English Machine Translation with Simple Logical Processing," presented before the Fall General Meeting of the American Institute of Electrical Engineers, they listed another

SORGEL — the Quietest dry-type transformers at standard prices

WE GUARANTEE that the sound levels of ALL Sorgel dry-type transformers are well below the established standards in ALL ratings up to 3000 Kva, and all voltages up to 15,000 volts. This has been an outstanding feature in Sorgel transformers for many years; in fact, we are the **originators** of low sound level dry-type transformers.

HIGHEST ENDORSEMENT. Sorgel Sound-Rated transformers have earned the highest endorsement of leading engineers and discriminating users.

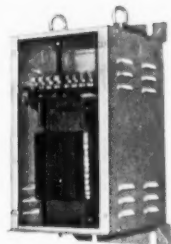
OUR MODERN TESTING FACILITIES enable us to prove the low sound level, efficiency, temperature rise, and performance of Sorgel transformers, before installation.

INSTALLATION SAVINGS. SORGEL dry-type transformers are so quiet that they can be installed in any convenient place inside of buildings, close to load centers. This results in shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Substation Transformers

The same quiet Sorgel transformers, in ALL ratings up to 3000 Kva and up to 15,000 volts, are also incorporated in substations.

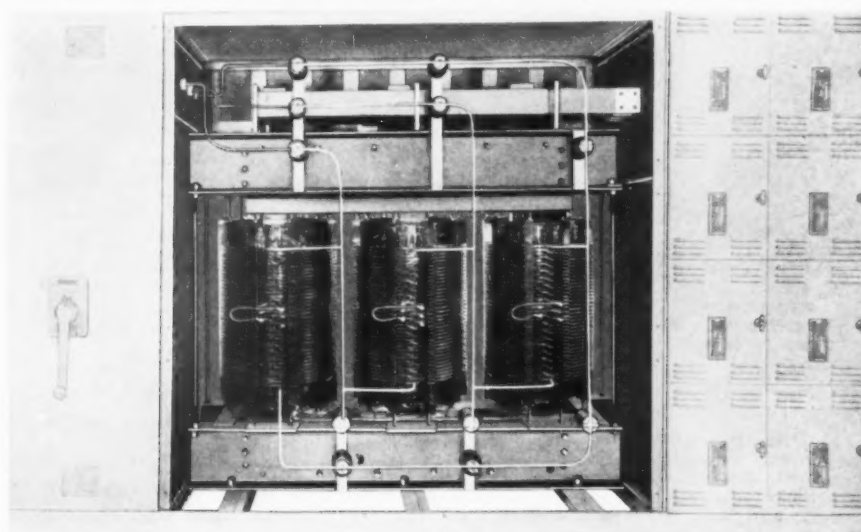
Procurable with any type or make of switchgear, or from any substation manufacturer.



20 to 75 KVA single phase.
Wall mounting.
Connection compartment
panel removed.

Sales engineers
in principal cities.

Consult the
classified section of
your telephone directory
or communicate
with our factory.

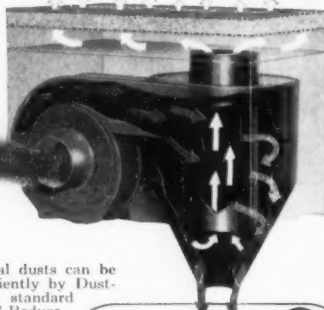


1000 Kva 13,200 volt Sorgel dry-type transformer in a substation—Compartment panel removed

SORGEL ELECTRIC CO., 843 West National Ave., Milwaukee 4, Wisconsin

CYCLONE SEPARATION

FOR MORE **EFFICIENT**
DUST COLLECTION
— **FILTERS LAST LONGER**



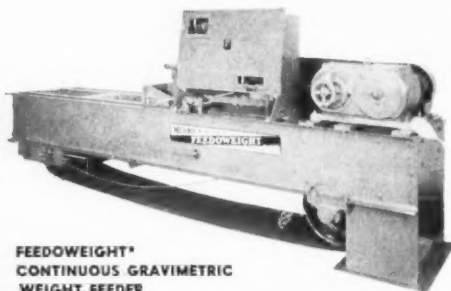
Almost all industrial dusts can be collected more efficiently by Dustkop. Thirty-seven standard models ready to use! Reduce installation costs — save space. Write for descriptive literature.

ALSO A COMPLETE LINE
OF MIST COLLECTORS



AGET MANUFACTURING COMPANY
1378 EAST CHURCH ST., ADRIAN, MICH.

Automatic In-Transit Weighing by **MERRICK!**



FEEDOWEIGHT®
CONTINUOUS GRAVIMETRIC
WEIGHT FEEDER

Automatic continuous constant weight feeder. Ideal for blending, proportioning and feeding of granular materials to process by weight.

Extensively used for ball and rod mill feeding. Widely accepted as the proper medium to accurately blend basic cement components such as clinker, gypsum, etc. Ruggedly constructed for long-life, trouble-free operation.

*Reg. U. S. Pat. Off.

Bulletin 253 on request

MERRICK SCALE MFG. CO.

PASSIAC

NEW JERSEY

difficulty in machine translation — the limitation in our present language knowledge.

"A skilled polyglot," they said, "accomplishes translation from one language to another by translating thoughts; the source language material is read and digested, and then the thought of the material is formed into target language sentences and recorded. The unskilled translator would translate first on a word-for-word basis, and then make improvements in the output by consideration of the context of the words. The ultimate in machine translation would be that of translation by thought as the accomplished polyglot would translate, but several fundamental problems remain to be solved before anything of this sort may be accomplished. For instance, there is a great spread between the amount of storage in the human brain and the amount of storage available in any present-day computer.

"The brain is estimated to have a total storage capacity of 10^{15} to 10^{20} bits. The largest of computers will store only about 10^9 bits, or not over one-millionth as much storage as the human brain. A second limitation is that of our present knowledge of language. Linguistic knowledge concerning many problems which are vital to machine translation is rather lacking. Thus it would seem that in the present elementary state of the machine translation art, we should attempt to perform our translations more as the unskilled translator — by basing our translations on the word-for-word translation, making such improvements as we can from a consideration of the context of the words in the sentence."

Consultants Chosen for Major Part Of Milwaukee's Water Expansion Project

The City of Milwaukee, Wis., has asked the Kansas City engineering firm of Black & Veatch to prepare plans for large parts of a \$54 million city water expansion program.

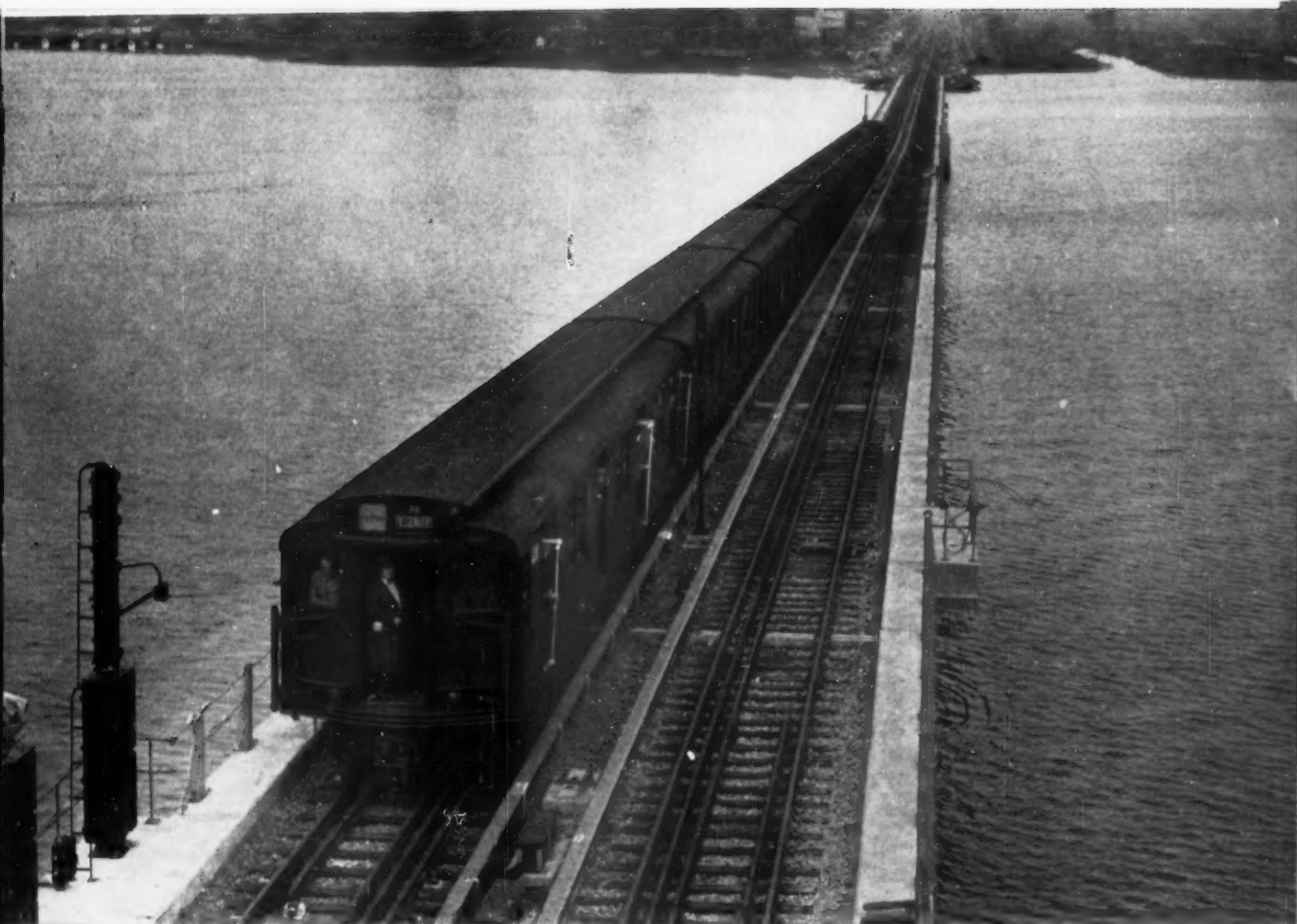
The engineering firm previously had made a study of Milwaukee's water needs for the next 15 years.

A report said the consultants would be given a contract for the major parts of two stages of construction plans for the first five years of the program during which \$35 million is to be spent.

Florida Toll Road to be Extended if Traffic Report is Favorable

If the traffic increase report on the Miami to Fort Pierce Sunshine State Parkway toll road for the first year is favorable, the Florida State Turnpike Authority will order an engineering study of the proposed extension to Orlando.

The tight money market has delayed a start on the extension from Fort Pierce to the Georgia state



Jamaica Bay Crossing, serving the Rockaway Extension of New York's Rapid Transit System, has 33,000 sq. ft. of wrought iron plate for protection against salt air and salt water corrosion.

This subway goes to sea over piers protected with 300 tons of Wrought Iron Plate



Protective scale which normally forms on the surface of wrought iron plates provides a long life additive for concrete substructures on this span.

Passenger safety and preventive maintenance account for the wide use of wrought iron for this new four-mile span.

To safeguard Jamaica Bay Span's substructure against marine elements and alternate freezing and thawing conditions, more than 300 tons of $\frac{1}{2}$ -inch thick wrought iron plate protects the concrete piers.

In addition, wrought iron electrical conduit guards power lines and air signal lines against foul weather. Topside, on the bridge structure, wrought iron pipe turns in yeoman service in railing applications. Another 175 tons of wrought iron—angles, clips, nuts and bolts—fasten pier plates and anchor wooden pier fenders.

Write our Engineering Service Department for specific information on wrought iron's ability in these services. A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

Designed and constructed under the supervision of the New York Transit Authority Engineering Department

Hardesty and Hanover, Consulting Engineers

American Bridge Company and Merritt-Chapman & Scott, General Contractors

BYERS Wrought Iron Tubular and Hot Rolled Products

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Corrosion costs you more than Wrought Iron

Winter Fun is King at The KING'S GATEWAY



Thrill to a winter wonderland weekend or full vacation.

EVERYTHING TO DO

Ice Skating (Instruction available) • Skiing—3 Ski Tows Operating Daily (Instruction and all necessary equipment available) • Snowshoeing • Tobogganing • Ski-Joring • Sleigh Riding • Hunting • Ice Fishing

EASY TO REACH

On U.S. 45 on the Wisconsin-Upper Michigan Border at Land O'Lakes, Chicago & North Western R. R. offers Pullman Service to Land O'Lakes—overnight from Chicago and Milwaukee.

Write for information or reservations.



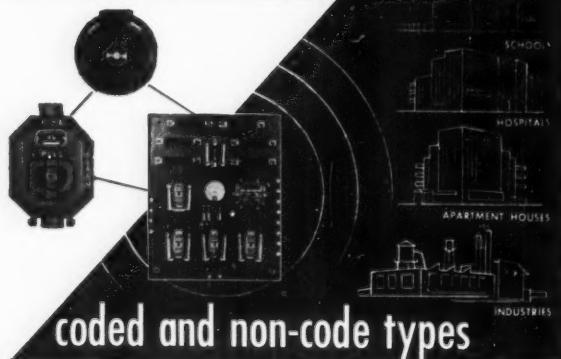
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WISCONSIN**

Phone 261



Interior Fire Alarm Systems



coded and non-code types

Complete reliability is the one thing we demand from a fire alarm system. Therefore, when ordering Interior Fire Alarm Systems, be sure to specify equipment (control panels, stations, and fire alarm bells) produced by Wheelock Signals, Inc., the originators of A-C Fire Alarm Systems.

Both coded and non-code types are available in various arrangements depending on type of building or establishment. Although Interior Fire Alarm Systems are intended primarily for warning occupants of a building, they can be connected into a municipal system.

Write for Bulletin FA-7

Engineering representatives in principal cities are available to assist in specifications.

Signal Engineering & Mfg. Co. has changed its name to
Wheelock SIGNALS
FIRE ALARM W S LONG BRANCH, N. J.

line. The authority recently approved the idea of a piecemeal extension when it appeared that the poor bond market would make sale of bonds for the state-long extension prohibitive. The original state-long extension to Jacksonville would cost an estimated \$185 million.

Harley, Ellington and Day Install a Bendix Electronic Computer

Harley, Ellington and Day, Inc., Detroit, Mich., engineers and architects, have installed a Bendix digital computer for use on highway projects. The firm estimated that using the computer on earthwork problems in highway work can result in a 30 to 1 saving in time and a 15 to 1 saving in cost.

In addition to earthwork and bridge problems, the computer can be used in the solution of such complex structural and mechanical design problems as rigid frames, wind stresses, slab design, truss analysis, heat losses, sewers, and hydraulics. Machine time will be available to other Michigan engineers and architects for assistance on special programs. The firm has trained two programmers who will be available for consultation.

Cost of Living Rises

Inflation is leaving its mark around Engineering Headquarters in New York. Assessments for space (and this is not called rent for some reason) has increased by 13 percent.

And don't be too surprised if NSPE increases dues. Again, rising costs.

New Jersey Society Forms Functional Section

Seventy persons met in Newark last month to organize a Consulting Engineers Functional Section of the New Jersey Society of Professional Engineers.

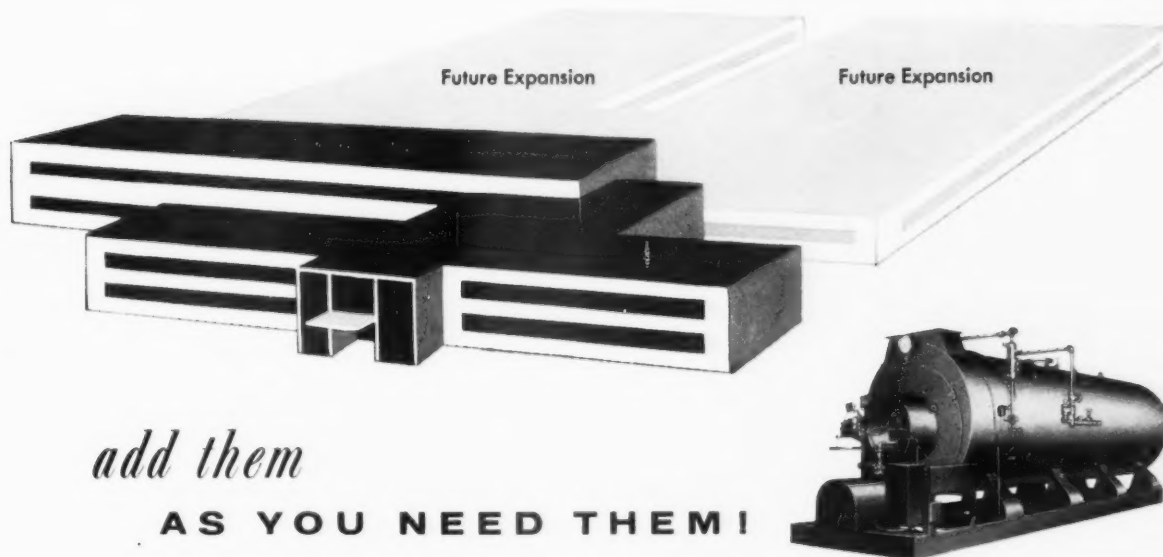
Officers, to serve until the New Jersey Society of Professional Engineers annual convention in Atlantic City on April 25-26 are: chairman, Joseph A. Rosenthal, Newark; vice-chairmen, William C. Baumann, Jersey City, Robert Morrison, Union, and Louis T. Klauder, Moorestown; secretary, Professor Odd Albert, Belmont; and treasurer, Vincent S. Wagner, Trenton.

Among the task forces suggested for the new functional section are groups for the study of various types of contracts, for the study of the Code of Ethics, and for legislation. It also was suggested that separate task forces be organized for principals in private practice and for employees.

Next meeting will be in Newark on Feb. 28 at the Military Park Hotel.

Plan for tomorrow

with CYCLOTHERM today!



add them

AS YOU NEED THEM!

With Cyclotherm Steam and Hot Water Generators you can plan your steam generating facilities to cover five — ten — fifteen years of plant expansion. Perhaps one 500 HP Cyclotherm will meet your present requirements. If you need 600 HP in 1958 — add a 100 HP Cyclotherm. If 200 more HP is needed in 1959, a 200 HP Cyclotherm will give you ample — *but not excess* — capacity. You buy as you grow — you pay only for what you use.

Only Cyclotherms lend themselves perfectly to a *progressive* increase in steam capacity. You can get them in 17 sizes — add units ranging from 18 to 750 HP. They're installed easily — need no stack, no excavation, no special foundation. A battery of Cyclotherms is easy to accommodate — a Cyclotherm takes up to 1/3 less space than even other package boilers. Completely factory assembled, too — set one down and with five simple connections it's ready to work.

Cyclotherm's Cyclonic Combustion guarantees plus 80% efficiency in only two passes. Larger units operate at from 30% to 100% of rated capacity without loss of efficiency — smaller units operate on and off automatically as load requires. Maintenance costs drop from 30% to 50%. And Cyclotherm's world-wide service-facilities are always at your disposal. For full information, write us today.

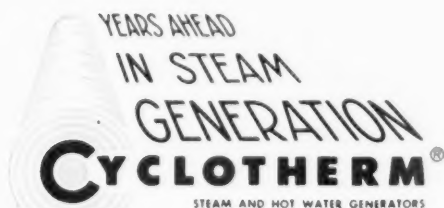
**Swan Rubber Did It —
So Can You!**

Swan Rubber Co., of Bucyrus, Ohio, world's largest maker of garden hose, installed an 80 HP Cyclotherm in 1949. As Swan expanded, it installed:

1951	100 HP Cyclotherm
1953	100 HP Cyclotherm
1954	125 HP Cyclotherm
1955	125 HP Cyclotherm
1956	Two 500 HP Cyclotherms, one 125 HP Cyclotherm. (Built additional plant in 1956)

And Swan plans to install during 1957 another 500 HP, another 125 HP and a 30 HP Cyclotherm. In 1949, Swan planned for the future with Cyclotherm. You can plan for your future with Cyclotherm today.

Clip to Your Letterhead:



A Division of National-U.S. Radiator Corp., Oswego, N.Y.

Cyclotherm Division
National-U.S. Radiator Corp.
36 E. First St., Oswego, N. Y.

Please send me your booklet *Cyclotherm Cyclonic Combustion*, also rotogravure copy of *Cyclotherm Sales Steam* with illustrations and descriptions of Cyclotherm installations.



Men in Engineering

Formation of a nuclear engineering and construction division has been announced by Holmes & Narver, Inc., of Los Angeles and Washington, D.C.

Kelly McBean is head of the Nuclear Division. Chief Nuclear Scientist is B. John Garrick.

The Civil Engineers and Land Surveyors Association of California and the San Diego Council of Civil Engineers and Land Surveyors joined in presenting a

plaque of appreciation to Gus Pullium, retired Special Investigator for the California Board of Registration.

Fred H. Gettler, Jr., member of the firm of Gibbs & Hill, Inc., has been entered by the firm in the School of Nuclear Science and Engineering sponsored by the Atomic Energy Commission. Two other members of G&H are already graduates of the course.

John E. Bowker, formerly with the Electric Boat Division of General Dynamics Corp., and Ira G. Stubbart, formerly with the Atomic Power Division of Westinghouse, have joined Gibbs & Hill to work on nuclear projects.

Christian Bakke and S. F. Guarnera have joined the Structural Engineering Department. Bakke formerly was with George Saathoff and Guarnera with Tippetts-Abbott-McCarthy-Stratton.

The Chicago Association of Consulting Engineers have initiated the following new members; Ralph Abramson, Bruce Bourne, Edward Daugherty, Paul Gawrusik, Stanley Howell, Jr., Jerome Klipp, John Maras, John Parmer, Henry Rothschild, Olin Schneider, Warren Thon, Lloyd Von Dermark, Frank Wells, Carroll Wohlfarth, and Rudolph Wolfson.

Daniel Koffler and Associates have opened an office for the practice of structural, mechanical, and sanitary engineering. They also plan to work in the field of bridges, industrial developments,

special structures, cold storage warehousing, parking garages, and airplane hangars. The office is at Dupont Blvd. & Washington Ave., New Castle, Del.

Fred S. Dubin, a partner in the consulting engineering firm of Fred S. Dubin Associates, Hartford, Conn., was guest lecturer at the Columbia University School of Architecture's class in "Contemporary Structures." He also is a regular visiting lecturer on mechanical systems for buildings at Yale, Harvard, and Washington University in St. Louis, Mo.

Peterson, Meyers & Associates, Inc., Engineers and Surveyors, have moved their offices to 206 Visscher Building, 534 South Pineapple Ave., Sarasota, Fla.

Edward J. Quirin, President and Director of Frederic R. Harris, Inc., Consulting Engineers, has been elected a member of the Board of Trustees of Knickerbocker Hospital.

Quirin is also a member of the American Institute of Consulting Engineers.



QUIRIN

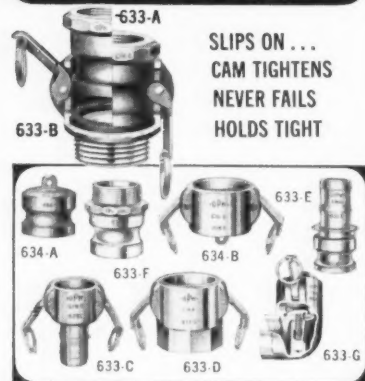
WILLIAMS

T. Cortlandt Williams, President, Stone & Webster Engineering Corp., has been elected to a one-year term as a member of the board of the National Industrial Conference Board.

The American Society of Tool Engineers installed its 15-member Board of Directors at its Semi-Annual Meeting in Milwaukee, Wis. They are: Harold E. Collins, Gustave Ben Berlien, Irving H. Buck, Wayne Ewing, Frank F.

KAMLOK QUICK COUPLERS

The Fastest, Safest, Surest Coupling Known



SLIPS ON...
CAM TIGHTENS
NEVER FAILS
HOLDS TIGHT

BRONZE • ALUMINUM • MONEL
STAINLESS STEEL • SEMI-STEEL

All styles of adaptors fit in all styles
of couplers of the same size.

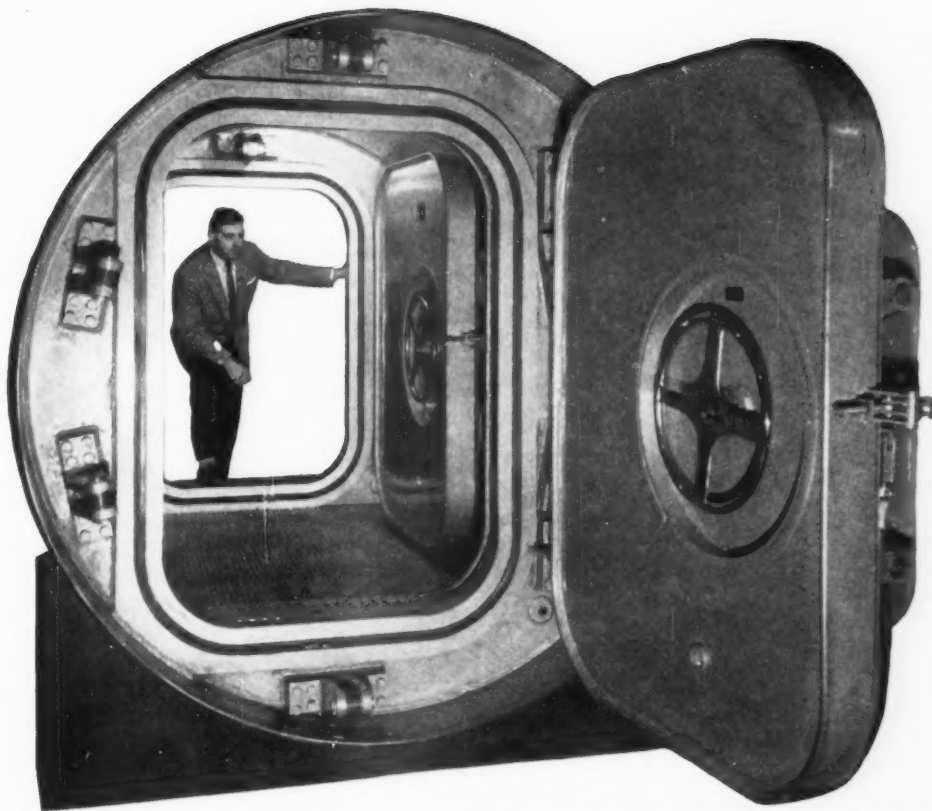
Write for Free Bulletin F-10

OPW CORPORATION

JORDAN
INDUSTRIAL
SALES DIVISION



6013 WIEHE ROAD
CINCINNATI 13, OHIO
ELmhurst 1-1352



Vincent Bicicchi, Pratt Engineer, standing at exterior door of a personnel lock for the Pleasanton, California atomic power plant.

Henry Pratt engineers the ... Door to Atomic Power Plants

The Henry Pratt Personnel Access Lock fulfills one of the most necessary requirements of an atomic power plant. It allows personnel to pass conveniently through the containment vessel to the reactor in such a way that the plant will fully comply with the **AEC code for reactor construction**.

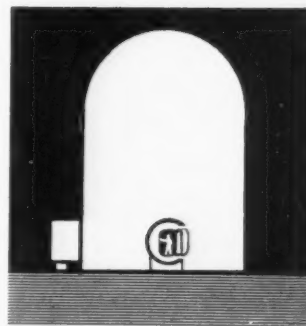
The design emphasizes strength and easy, fool-proof operation. The lock can be built to withstand any practicable pressure, with compression type or pneumatic door seals. Simple operating principles increase its safety factor and include an **interlocking feature** that keeps one door open when the other is closed.

Future Developments in Access Locks now being planned include larger sizes to accommodate trucks, and fully automatic locks that permit manual operation if power fails.

Drawing on a background of 50 years experience in supplying the power industry with valving, steel fabrication and special equipment, **Henry Pratt has been a pioneer in designing and building for atomic power***.

With experience, skilled engineers and two plants equipped with large metal working facilities, you can look to Pratt for help in building tomorrow's power.

* See: Nuclear Power Engineering by Henry C. Schwenk, Henry Pratt Company, and Robert H. Shannon, United Engineers & Constructors, Inc. 344 pages, 131 ill., McGraw-Hill, 1957



Pleasanton, Calif. The first privately financed atomic power plant in the U. S. will use two Henry Pratt Personnel Access locks.

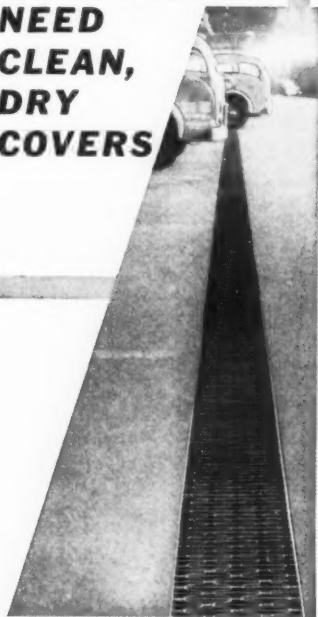


MANUFACTURERS OF
Personnel Access Locks
Rubber Seat Butterfly Valves
Turbine-Condenser Expansion Joints
Paper Mill and Converting Equipment
Specialized Steel Fabrication

Henry Pratt Company, 2222 S. Halsted St., Chicago 8, Ill. Representatives in principal cities

Plant Trenches

**NEED
CLEAN,
DRY
COVERS**



TRENCHES in floors of industrial plants often house sub-surface pipes, valves, etc. Often these trenches are covered with cast iron plates or wooden boards which collect grease, oil or water, making unsafe floor areas.

Trench covers of 75% open Irving metal grating remain safe because they will not collect these substances. In addition to providing drainage and traction, grating sections can be easily removed for access to trenches.



Manufacturers of Riveted, Pressure-Locked and Welded Gratings in Steel, Aluminum and other metals for over 50 years.

"A Fitting Grating for Every Purpose"

IRVICO®

IRVING SUBWAY GRATING CO., Inc.
Originators of the Grating Industry

Offices and Plants at
5056 27th St., LONG ISLAND CITY 1, N. Y.
1856 10th St., OAKLAND 23, CALIFORNIA

Ford, George A. Goodwin, Edward Hollingsworth, H. Dale Long, Philip R. Marsilius, Howard C. McMillen, Joseph L. Petz, J. X. Ryneska, Leslie C. Seager, Charles M. Smillie, and William A. Thomas. Harold E. Collins will act as Chairman of the Board and also President.

James R. Stoudt has been appointed Manager, Nuclear Energy Division, Gilbert Associates, Inc., Reading, Pa. At the same time he was elected a member of the Board of Directors.



STOUDT



KUDROFF

Marvin J. Kudroff has been appointed director of engineering of Daniel, Mann, Johnson, & Mendenhall, Architects & Engineers, of Los Angeles. Kudroff is an Associate of the firm.

John E. Kent has joined the Engineering Division of Arthur D. Little, Inc. He formerly was with Sylvania Electric Products, Inc.

E. C. Wenger, manager of the Conservation Bureau of the Portland Cement Association since 1947, has retired from PCA to take up practice as a consulting engineer in the highway and municipal improvement field.

The firm of Henry F. Teichmann, Inc. has moved to new offices five miles south of Mt. Lebanon, Route 19, Pittsburgh, Pa.

Foster D. Snell, Inc., consulting chemists and chemical engineers, have purchased another 10-story building, this one at 28 West 15th St., directly across the street from their present location.

Space in the new building will

be used for expanding each of the existing technical departments, as well as for two or more additional service groups.

Davidson-Kennedy Associates Co., designers of chemical process plants, have appointed A. T. Sieron as Project Manager and Oliver J. Bolduc as Chief Process Engineer of the firm.

The firm of Frederick R. Harris, Inc., Consulting Engineers, and the management consulting firm of Wallace Clark & Co., Inc. have merged. The Clark company will operate as a division of the Harris firm under the management of its present officers.

Dr. Ole Singstad, senior partner in Singstad & Baillie, Consulting Engineers, has received the New York State Society of Professional Engineers annual award for distinguished engineering service.

A past President of the American Institute of Consulting Engineers, Dr. Singstad most recently was consulting engineer for the Baltimore Harbor Tunnel, largest vehicular subaqueous tunnel project in the country outside of the New York City area.



SINGSTAD



PORTER

Leo A. Porter has been appointed Chief Bridge Engineer for Capitol Engineering Corp., Dillsburg, Pa. He formerly was Chief Bridge Engineer for the Pennsylvania Department of Highways.

Mid-South Engineering Co., Inc., Macon, Ga., has changed its name to Tribble & Associates, Consulting Engineers. ▲▲

CONSULTING ENGINEER

**don't just filter
your client's air
when you can
clean it
inexpensively!**

PRECIPITRON electronic air cleaning
can pay for itself in less than a year!

Commercial building management spends an average of 57¢ per square foot annually in routine cleaning and maintenance — even with mechanically filtered air. Do you know that Precipitron® electronic air cleaning can reduce this expenditure up to 50% — pay for itself in less than a year!

Here are the facts . . .

The heating, ventilating or air conditioning system in the average city building sucks in over 200,000,000 dirt particles — *mostly invisible* — with every cubic foot of air! Mechanical filters rarely catch over 10% of these contaminants — the other 90% lodge in draperies and rugs, soil walls, ceilings and merchandise. Precipitron electronic air cleaning removes up to 97% of *all* atmospheric dirt!

Here are the savings reported by a nationwide variety chain in an actual store test: total dirt reduced

85%; redecorating costs reduced 80%; washing costs down 90%; labor down 25%; soilage mark-downs reduced 37%. Costs attributed to dirt-laden air dropped from \$37,000 to \$20,000 annually . . . a profit bonus of \$17,000!

Such savings prove how many Precipitron installations actually pay for themselves in less than a year . . . then savings become profits. That's why it's just plain good business sense to install Precipitron in commercial buildings.

What is Precipitron? The electronic air cleaner which electrostatically charges dirt particles, attracts them out of the air and automatically washes them down a drain. Sizes permit replacing mechanical filter installations.

Call your Sturtevant Division Sales Engineer or write Westinghouse Electric Corporation, Dept. A-1, Hyde Park, Boston 36, Massachusetts.

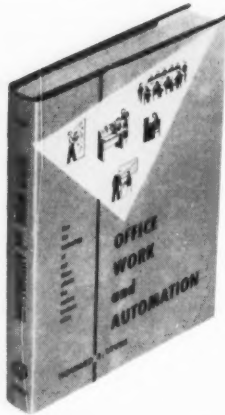
J-80636

WESTINGHOUSE AIR CLEANING

YOU CAN BE SURE...IF IT'S **Westinghouse**



How does today's technology
affect the business office?



OFFICE WORK and AUTOMATION

By HOWARD S. LEVIN
Ebasco Services, Inc.

In this penetrating work, Mr. Levin describes in non-technical language how recent developments are bringing about a challenging re-appraisal of the business office.

With information handling as the central theme, the book views the office as a kind of "information factory," turning raw information into processed information that serves a management objective. The men responsible for designing business systems are looked upon as "information engineers" with three fundamental tools at their disposal—

- **INTEGRATED DATA PROCESSING**—
facilitating the initial handling of information;
- **ELECTRONIC COMPUTERS**—
aiding in the processing of information;
- **OPERATIONS RESEARCH**—
contributing to the use of information.

1956 203 pages Illus. \$4.50

Order your copy from

CONSULTING ENGINEER

217 Wayne St., St. Joseph, Mich.



EARTH PRESSURES AND RETAINING WALLS, by Whitney Clark Huntington; John Wiley & Sons, Inc.; 534 pp.; \$11.50.

Reviewed by
Richard J. Woodward
Woodward-Clyde-Sherard &
Associates

The objective of this book is to bridge the gap between those soil mechanics theories which deal with earth pressures and foundations, and the actual design of retaining walls. A considerable amount of background is given, and the whole subject is thoroughly discussed with formulas, and even derivations of the formulas. Conditions governing the application of the Rankine and Coulomb theories are established, and the author points out the particular types of walls for which each theory is most valid.

Retaining walls with cohesionless and cohesive backfills are treated separately in the book using one of the following methods: trial wedge method; circle of stress method; and friction wide method. By each of the aforementioned methods the position of the plane of rupture and the numerical value of the pressure can be determined, provided some data concerning the angle of internal friction or the unit cohesion are known or assumed. The trial wedge method, which appears to be preferable to the others, is essentially a variation of Culmann's method published

Books

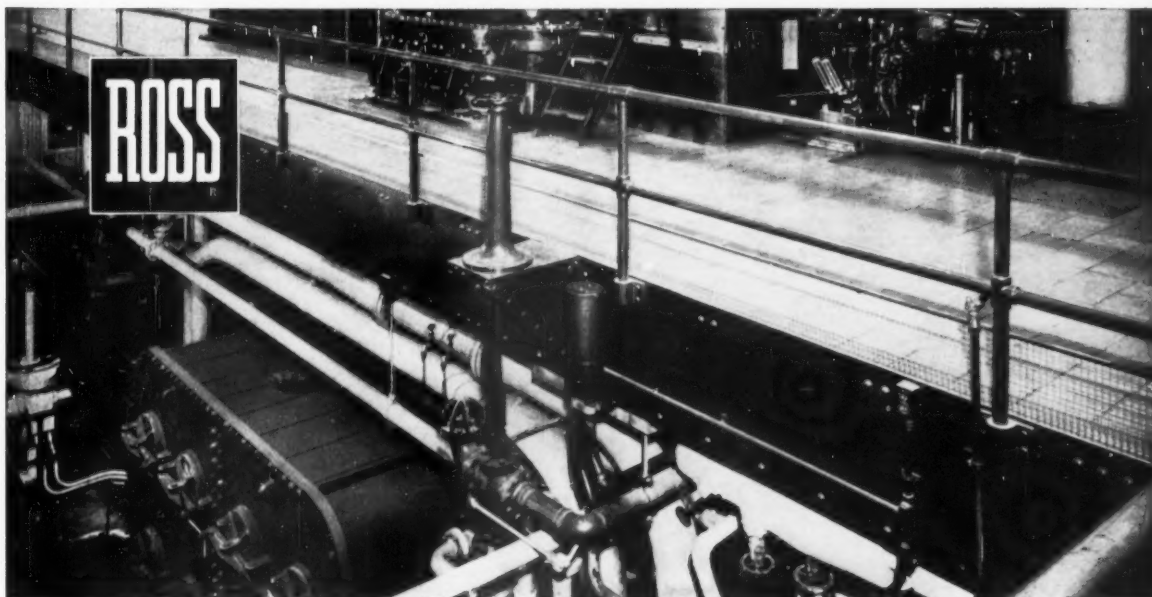
For the Libraries of
Consulting Engineers

in Switzerland in 1866, and further discussed by Cain in this country in 1916.

The principles and the details of design of retaining walls are discussed in the last chapter of the book. Gravity, semigravity, cantilever, and counterfoot walls are discussed separately together with design requirements, trial dimensions, and acting forces. A thoroughly elaborated design example is given for each type. The drawings in the examples, and throughout the book, are exceedingly well finished and clear.

The book as a whole should be considered as a valuable addition to the library of a consulting engineering office that may be involved in retaining wall design. In addition to the design procedures it also furnishes information on the choice of a type of wall and discusses possibilities of wall failures. The author's criticism of some of the methods of analysis used in practice is worth the attention of engineers. Examples of the above are the wrong application of the equivalent fluid method to the design of walls with sloping backfills and an incorrect design procedure for cantilever walls.

On the negative side, the book is rather voluminous. This is caused partly by the inclusion of information that either is non-essential (as some of the flow net details) or that may be found elsewhere (as the article on reinforced concrete). There are



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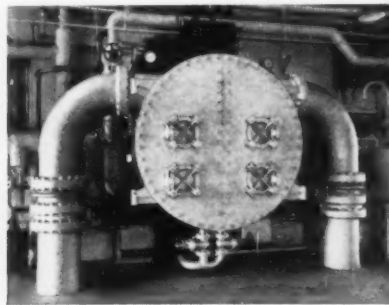
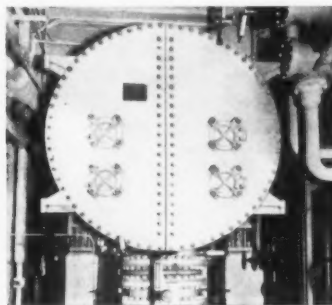
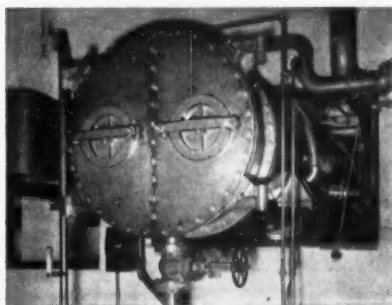
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many repetitions since, for purposes of making consultation of the book more convenient, the author has subdivided the book into more or less self-contained articles that can be referred to without reading all of the book.

AERODYNAMICS, PROPULSION, STRUCTURES AND DESIGN PRACTICE, by E. A. Bonney, M. J. Zucrow, and C. W. Besserer; D. Von Nostrand, Inc.; 595 pp.; \$10.00.

Reviewed
by

Loren E. Bollinger
The Ohio State University

This volume is the second in the series "Principles of Guided Missile Design" edited by Grayson Merrill, Captain, USN. In an effort to set forth the underlying principles of guided missile technology, this book encompasses three of the missile components systems, namely, "Aerodynamics," "Propulsion," and "Structures and Design Practice."

The program of the series is to provide a basis for instruction to graduate students, professional engineers, and technical officers of the armed services so that they can become well grounded in the technology of guided missiles. Although many topics of interest are limited by military security, the fundamentals are present.

Mr. E. A. Bonney, Aerodynamics Group Supervisor at the Applied Physics Laboratory, Johns Hopkins University, authored the section on aerodynamics. After reviewing the atmospheric conditions assumed in guided missile design, he discusses supersonic aerodynamics with particular emphasis on shock waves. Fundamental types of aerodynamic surfaces for supersonic flight together with the equations for static and dynamic stability are presented. Linearized theory is used throughout.

The last four chapters give an

interesting word description of loading, wind tunnels and ballistic ranges, flight tests, and the launching and boost phase of missiles. Bonney has included a very extensive and well-organized bibliography.

The propulsion section is written by Dr. M. J. Zucrow, of Purdue University. His eight chapters are aimed toward engineers who are not specialists in propulsion.

Fundamental principles and features of the various reaction-type engines are followed by definitions and descriptions of terms associated with propulsion, combustion, and rocketry.

The author next applies the momentum theory to propulsion systems and introduces elementary gas dynamics. He discusses details of converging-diverging nozzles for engines.

Basic postulates of supersonic diffusers are given, together with an introduction to oblique-shock diffusers and their application in the Oswatitsch- and Ferri-type inlets. The last three chapters contain fundamentals of turbojet, ramjet, and rocket engines in considerable detail.

The reference list is rather heavily weighted in favor of publications emanating from the author's institution.

Mr. C. W. Besserer of the Ramo-Woolridge Corporation wrote five chapters for the structures section. His descriptive exposition includes discussion of loading, materials, aeroelasticity, environmental considerations, and reliability.

The basic principles of the complex electronics packaging design for missiles are considered. The last chapter presents a general integration of missile design fields.

Consulting engineers engaged in the vast guided missile field will find this book extremely useful in broadening their background. With the exception of some portions relating to propulsion, the volume is principally descriptive. The entire book is quite readable. ▲▲



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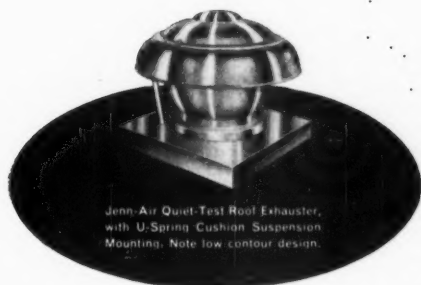
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Date	Sponsor	Event	Location
Jan. 6-8	American Institute of Electrical Engineers and Others	4th National Symposium	Hotel Statler Washington, D. C.
Jan. 6-8	American Management Association	Special Packaging Conference	Commodore Hotel New York, N.Y.
Jan. 13	American Institute of Consulting Engineers	Annual Dinner Meeting	New York, N.Y.
Jan. 13-16	Stanford Research Institute	3rd Annual Industrial Economics Conference	Ambassador Hotel Los Angeles, Calif.
Jan. 14-15	Instrument Society of America	Yankee Instrument Fair & Symposium	Hotel Bradford Boston, Mass.
Jan. 20-23	American Road Builders Association	Annual Convention	Sheraton-Park Hotel Washington, D. C.
Jan. 27-29	American Society of Heating and Air-Conditioning Engineers	Annual Meeting	Penn-Sheraton Hotel Pittsburgh, Pa.
Jan. 30-31	American Society for Engineering Education	College-Industry Conference	U. of M. Campus Ann Arbor, Mich.
Feb. 3-4	Instrument Society of America	National Conference	Wilmington, Del.
Feb. 3-7	American Institute of Electrical Engineers	General Meeting	Statler and Sheraton-McAlpin Hotels New York, N.Y.
Feb. 4-6	The Society of the Plastics Industry Inc.	13th Conference	Edgewater Beach Chicago, Ill.
Feb. 5	American Institute of Consulting Engineers	Monthly Meeting	Engineers Club New York, N.Y.
Feb. 10-14	American Society for Testing Materials	Committee Week	Hotel Statler St. Louis, Mo.
Feb. 14-15	National Society of Professional Engineers	National Board Meeting	Kellogg Center East Lansing, Mich.
Feb. 24-27	American Concrete Institute	Annual Convention	Morrison Hotel Chicago, Ill.
Feb. 24-28	American Society of Civil Engineers	National Convention	Hotel Sherman Chicago, Ill.
March 3-5	American Management Association	Electronics Conference	Statler Hotel New York, N.Y.
March 3-6	American Society of Mechanical Engineers	Conference and Exhibit	Shoreham Hotel Washington, D.C.
March 17-21	The Atomic Industry	1958 Trade Show	International Amphitheatre Chicago, Ill.

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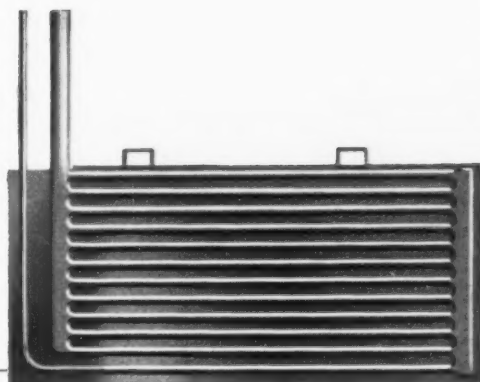
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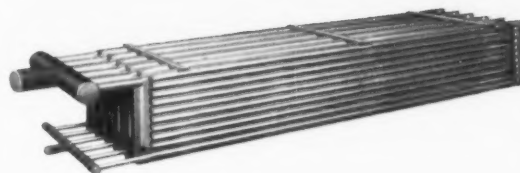
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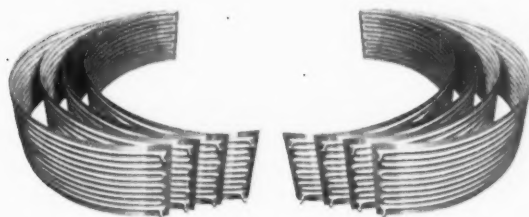
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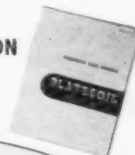
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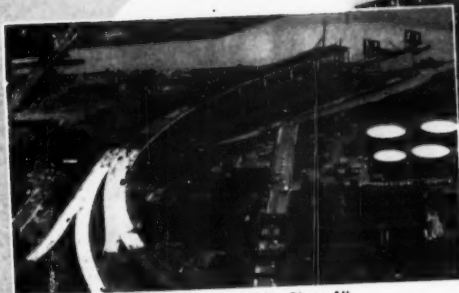


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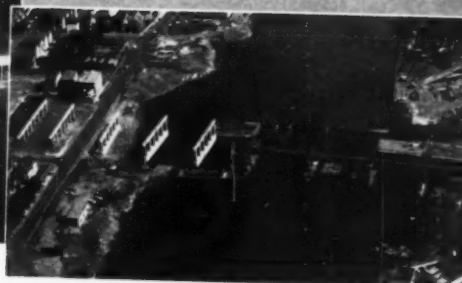
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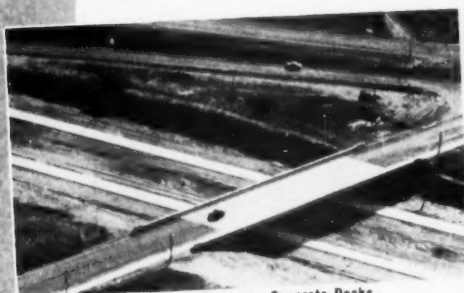
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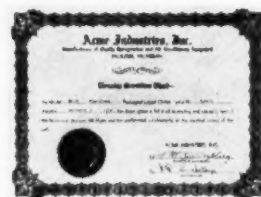
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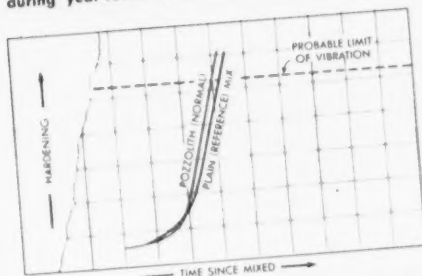


CHART 1 — Comparison of rate of hardening at 70°F. of POZZOLITH (Normal) and Plain mixes designed to same strength.

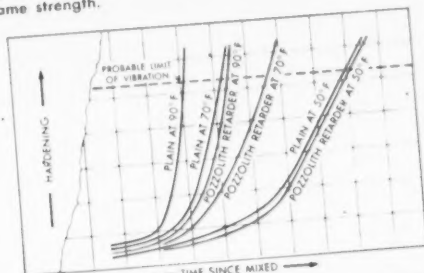


CHART 2 — Comparison of rate of hardening at 90°, 70° and 50°F. of POZZOLITH Retarder mixes and Plain mixes designed to same strength.

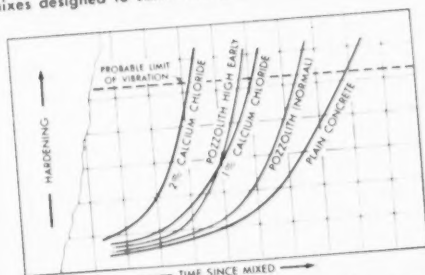


CHART 3 — Comparison of rate of hardening at 50°F. of POZZOLITH High Early and POZZOLITH (Normal) mixes, with Plain and Calcium Chloride mixes of equal cement content.

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Limit of vibration referred to in these charts is the point during hardening of concrete when it no longer can be reworked or be made plastic by the use of vibrators.

CHART 1 — Normal Hardening

POZZOLITH (Normal) mix has practically the same rate of hardening as the Plain mix of equal strength.

CHART 2 — Retarded Hardening

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2. Overcoming stiffening enroute where concrete is transported long distances.
3. Reduced cracking of concrete slabs and paving from premature stiffening of surface.
4. Avoiding cold joints between subsequent pours in mass or structural concrete.

At 70°: POZZOLITH Retarder provides advantages similar to those listed above.

At 50°: POZZOLITH Retarder is unique in that it does not retard more than Plain mixes at the same low temperatures. This safeguards against excessive retardation from an unexpected drop in temperature.

CHART 3 — Accelerated Hardening

At low temperatures and with equal cement factors, POZZOLITH (Normal) mixes harden sooner than Plain mixes. POZZOLITH High Early mixes harden more rapidly than 1% Calcium Chloride mixes. Both POZZOLITH formulations facilitate earlier finishing.

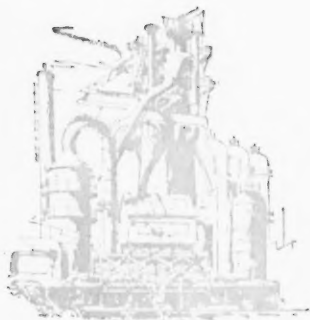
Page from booklet "POZZOLITH® Concrete Control Facts" . . .

which also shows how POZZOLITH improves control of water content and entrained air . . . to aid in obtaining top quality concrete and lowest cost-in-place concrete. Copy of booklet on request.



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Cochrane HOT PROCESS

AT U.S. STEEL'S CLAIRTON PLANT



Designed to soften and deaerate 100,000 GPH of boiler feed water, this Cochrane unit at U.S. Steel's plant is a sludge blanket design deaerating type Hot Process Softener with a 38' dia. spherical top sedimentation tank. The Softener is followed by six 11' dia. anthracite filters equipped with surface washers.

Cochrane pioneered the versatile Hot Process Softener. Its flexibility and efficiency are unquestioned and it provides a water softening process that can handle both turbid surface supplies and clear well waters.

Cochrane Hot Process Softeners can be used to reduce silica economically and effectively. It is also possible to provide integral deaeration elements for condensate and treated makeup where required.

For medium and high pressure boilers, Hot Process can be followed by Hot Zeolite to provide zero hardness and lower solids as well as to reduce CO_2 in the steam.

If you now have a Hot Process Softener, Cochrane Hot Zeolite may be readily added, assuring higher effluent quality at lower treating cost.

Cochrane, first in water conditioning for over half a century, continues to lead the way in Hot Process and Hot Zeolite. Call our engineers for the answer to your problem. Ask for Publication 4801.

Cochrane

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